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Notes of the Month

THE Silver Jubilee Meeting of the Indian Science Congress Association, which was held at Calcutta early last month and was attended by a delegation from the British Association, opened on a note of sadness, with the panegyric pronounced by Sir James Jeans, F.R.S., President of the Congress, on the late Lord Rutherford, O.M., F.R.S., who was to have presided. "Until a very few weeks ago," Sir James said, "we had hoped to assemble here under the presidency of one of the greatest scientists of all time, and it is inevitable that his sudden and tragic death should be uppermost, not only in the thoughts of those of us who come from Europe, most of whom knew him personally, but in the thoughts of everyone here. For his works had made him known to us all." Sir James quoted the words of another great physicist, Niels Bohr—who, speaking of Rutherford's work to a recent congress of physicists, said: "His achievements are so great that, at a gathering of physicists like the one here assembled, they provide the background of almost every word that is spoken."

* * * *

Sir James went on to say that Lord Rutherford would not be altogether absent from the meeting. He had looked forward with the greatest interest and eagerness to the occasion, and had already written a presidential address for it, part of which Sir James read later on. Lord Rutherford's address, a very brief excerpt from

which appears on page 37, tells us, in his own words, of his latest work of all—that in nuclear physics, and especially in what he described as "the new alchemy," the transmutation of the elements. This alone would have ensured him a place in the foremost rank of physicists, and yet it formed only a small part of the total achievement of his life. Sir James spoke of Rutherford's early experiments in wireless telegraphy; his reduction of the puzzling phenomena of radioactivity to law and order, and, in collaboration with Soddy, his discovery of the physical interpretation of this law and order. Radioactivity, they found, indicated the transmutation of one element into others through processes of spontaneous atomic explosion. These discoveries, together with his work on the alpha-particles which were emitted at these radioactive explosions as projectiles; the discovery of the composition of atoms by bombardment with these particles; and the demonstration that similar bombardments could change the constitution of the atomic nuclei, and so literally transmute the elements, were perhaps the outstanding landmarks in Rutherford's career, but in truth most of his investigations were key investigations, each brilliant in its simplicity of conception, masterly in its execution and far-reaching in its consequences.

* * * *

The annual report of Lieut.-Colonel C. H. H. Harold, Director of Water Examination to the Metropolitan Water Board, contains noteworthy discoveries in the domain of biology. In the filter-beds at Kempton Park quantities of the blind well-shrimp, *Niphargus aquilex*, a small pigmentless crustacean related to the common freshwater shrimp, were discovered, along with two species of Copepods. In the Lea Bridge filter wells was found the more remarkable *Eucrangonyx gracilis*, another amphipod crustacean, which hitherto has been recorded only from North America. No solution of their presence in the London water-supply has yet been suggested; the specimens, having apparently developed out of the light, have a bleached appearance unlike their normal colour, but they are by no means eyeless. A

more detailed survey, to trace the origin of the filter-bed fauna, is contemplated.

* * * *

The investigation, by the National Institute of Industrial Psychology and the British Institute of Adult Education, into the problems of leisure has now taken concrete form and the work began in January with the first-hand examination of a representative district of the first category chosen. This is represented by "a town of varied industries where the dwellings, centres of work, and recreational facilities are within walking distance of one another." The town selected after careful consideration is Ipswich, which has varied industries and a population of 87,000. It is hoped to record further developments next month.

* * * *

The Annual Meeting of the British Association will be held this year in Cambridge, from August 17th to 24th under the presidency of the Rt. Hon. Lord Rayleigh, F.R.S. The following sectional presidents have been appointed: Section A (Mathematical and Physical Sciences), Dr. C. G. Darwin, F.R.S.; B (Chemistry), Prof. C. S. Gibson, O.B.E., F.R.S.; C (Geology), Prof. H. H. Swinnerton; D (Zoology), Dr. S. W. Kemp, F.R.S.; E (Geography), Prof. T. Griffith Taylor; F (Economics), Mr. R. F. Harrod; G (Engineering), Prof. R. V. Southwell, F.R.S.; H (Anthropology), Prof. V. Gordon Childe; J (Psychology), Dr. R. H. Thouless; K (Botany), Prof. W. Stiles, F.R.S.; L (Education), Mr. John Sargent; M (Agriculture), Prof. R. G. Stapledon, C.B.E.

* * * *

The cause of near-eastern archaeology has suffered a grievous blow in the cowardly murder of Mr. J. L. Starkey, last month, at Beit Jibrin in Palestine, on the road from Hebron to Lachish. Starkey was in the prime of life and at the height of his career as an excavator, and his magnificent work at Lachish (Tell Duweir) was well known to readers of DISCOVERY, thanks very largely to the generous help that he never failed in giving, in the supply of both information and illustration. The work at Lachish was only in its infancy—Starkey himself used to say that a century might well be spent in the exploration of the site—but already he had made the discovery of the earliest known Hebrew manuscript, and he was hoping for more material to be unearthed which should throw further light on the decipherment of the writing. The bandits could scarcely have chosen a victim whose presence would be more regretted; Starkey's refreshingly vigorous personality fitted him

excellently to his task of excavating in rough country; and his open and straightforward manner endeared him alike to his British and his Arab assistants. It seems fated that every country in the throes of political unrest should lose its best friends; and Palestine is no exception.

* * * *

Notwithstanding reassurance as to the adequacy of the measures taken to protect the artistic treasures of Spain, archaeologists have been much perturbed lest the priceless Palaeolithic paintings of the caves of northern and eastern Spain, both within the zone of military operations, should suffer damage. Professor H. Obermaier of Madrid has now been informed by a journalist, who had himself visited the famous cave of Altamira, near Santander, which contains the pictures of the bulls, the first Palaeolithic paintings to be discovered in Spain in 1835, that they were still undamaged in September last, although the cave had served to house some hundreds of refugees, and the house of the guide had been occupied by a member of the "Red" staff. From other sources information has been received that in the other caves of northern Spain in which there are paintings, they also are intact. Nothing, however, is known of the fate of the paintings of the eastern school of Spanish Stone-Age art, of which some of the most important are in the caves of the province of Teruel, the scene of recent fighting.

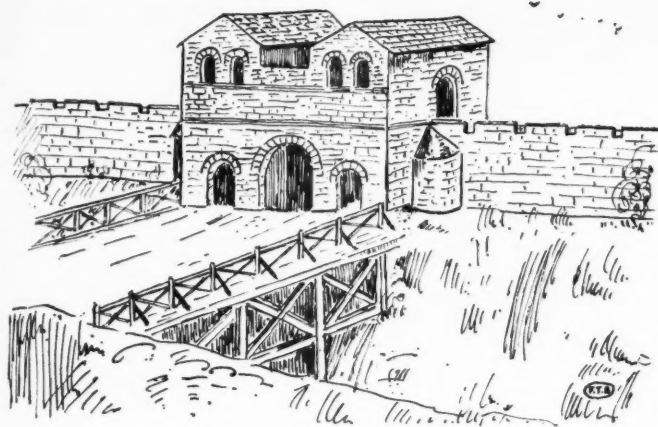
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In this connection it is perhaps worth mention that Professor Obermaier has recently reviewed the evidence for the dating of the paintings of this eastern school of Stone-Age art in the light of recent discovery. The paintings differ from those of northern Spain in the frequency with which the human form is represented, both singly and in groups. In the north representations of man are completely absent, except for two or three ritualistic or symbolic figures. The East Spanish paintings show also the dress and ornament of men and women, their mode of life, hunting and war, and even afford some evidence of their religious beliefs. Their weapons include the bow; and if the paintings are of Palaeolithic age, they constitute, with one possible exception, the sole evidence of the use of the bow at this early date. Some archaeologists, therefore, have argued that, taken in conjunction with the general character of the art and the mode of life depicted, the paintings are later than Palaeolithic. Professor Obermaier maintains, however, that not only are their general characteristics identical with those of the northern school, but that the animal shown in the eastern paintings belong to the Pleistocene and constitute a true Palaeolithic fauna.



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THE NEWPORT ARCH AT LINCOLN



The discovery of the existence of a west postern arch to the Newport Arch, the famous Roman gateway of Lincoln, is among the most important recent advances in our knowledge of Roman Britain. The relation of the Roman town-wall to the gate has likewise been revealed and the general lay-out of the monument ascertained. The adjoining sketch, by the author, indicates how the Arch may have appeared in Roman times, from the north, with the town-ditch in front of it.

By F. T. Baker, Curator, City and County Museum, Lincoln.

THE Newport Arch at Lincoln has long been famous as the only Roman gateway in Britain that has remained open and used for traffic from the period of its construction to the present day. Stukeley, when visiting the city in 1722, described it in his *Itinerarium Curiosum* as "the noblest remnant of this sort in Britain," and undoubtedly the Newport Arch is unique in many respects and a priceless ancient monument.

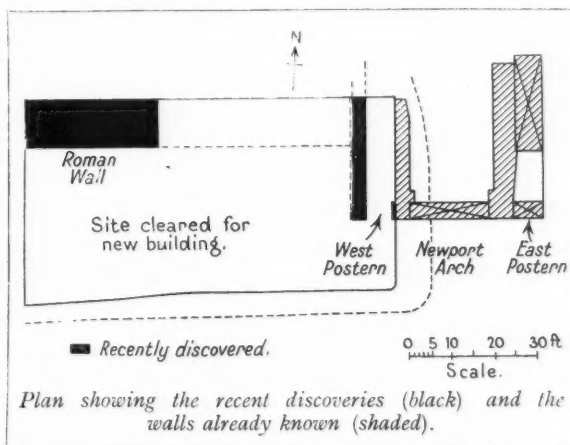
Originally, the arch was the northern gateway to the Roman town of *Lindum Colonia*, and it is the only one of its four known gateways that remains. There is not at present evidence from which a satisfactory date for the construction of the arch may be deduced, but it may have been built in the 2nd century A.D., soon after the period of legionary occupation, when the town was elevated to the status of *colonia*, a designation shared only by three other Roman-British towns: Gloucester, York, and Colchester.

The present arch is the south face of the Roman gateway, and consists of a main arch for wheeled traffic and a smaller eastern postern arch for pedestrians. It had always been assumed that the symmetry of the arch would, in the original design, be completed by the addition of another postern arch to the west, but definite evidence was not available. At the time of Stukeley's visit the main arch and east postern were visible (the latter not in use but walled up with stone), but he notes "against the left (west) side is a house built" concealing the supposed remains of the west postern. This house, latterly converted into a shop, had remained the hindrance to the complete understanding of the construction of the arch until, in October last, it was demolished by the Lincoln Co-operative Society for the erection of a new shop. This

demolition revealed the springing stones of the west postern arch and finally settled the problem.

The gateway was symmetrical. The west postern arch measured exactly the same as the one on the east. In addition to the springing stone of the arch, the line of the west wall of the postern gateway was traced (see plan). An interesting sidelight on the method of constructing the arch was seen in a cavity in the centre of the stone, from which the spring of the arch began. The inside of the cavity was stained bright green and no doubt marked the position of a bronze dowel to secure the stones.

A fine section of the Roman wall was also revealed in the excavation for the new buildings. This settled



another problem—the relationship between the wall and the gateway. From the evidence obtained it was seen that the wall joined the gateway between its



The springing of the west postern arch. The cavity for the bronze dowel is seen in the centre of the stone nearer the camera.

north and south faces and was not flush with either face as had been suggested by several writers. It was inset 17 feet from the south face. The corners on the north (outside) of the wall may have been filled by round bastions. On the south side this would not be

necessary and evidence was not seen of their occurrence in the excavations for trenches. The wall was 12 feet in thickness. Its south face of dressed stone was well preserved; the characteristic rubble filling contained some fragments of moulded stones of Roman workmanship.

Of the gateway as it stands at present only the archways and the stonework of the south face (depicted below) are conclusively Roman. The walling to the north and the tunnel behind the east postern all appear to have been reconstructed or built in post-Roman times. The material of the arch is local Lincolnshire limestone. The main arch, 16 feet in diameter, is composed of twenty-six large wedge-shaped stones assembled without the recognised key-stone. The original height would be about 23 feet, as the Roman level is between eight and nine feet below the present roadway. A remarkable feature in the construction is the seven courses of horizontal stones, some as much as six feet long, laid on either side of the main arch to take off the side thrust. On its north face the arch is strengthened by two buttresses, three feet by one foot, extending to the top of the wall. The diameter of the postern arches is 7 feet and their original height would be about 15 feet.

The evidence of the length of the west wall (which extends further under property to the north) found in the recent excavation, leaves little doubt that originally there were corresponding arches some thirty-five or forty feet to the north. The space between would be roofed over and garrison rooms built above with com-



From Charles Breare's "Short History of Lincolnshire," by courtesy of Messrs. A. Brown & Sons, Ltd.

The Newport Arch (main archway and east postern) as it appeared until the recent demolitions.

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munications to the walls on either side for patrol. To the north of the city, the gateway and walls were defended by a deep ditch, which still in some parts is about 80 feet wide and 20 feet deep. This may have been crossed at the gateway by a wooden bridge or alternatively, the ditch may have been broken at the gate to allow passage into the town.

In Roman times, the gateway with garrison rooms above would be an impressive structure and justify the comment of Stukeley that "they that look upon a gate among the vestiges of the *Forum* of Nerva at Rome, will think they see the counterpart of this; but, of the two, this has the most grandeur."

The new scheme allows for the remains of the west postern to be exposed and a footway will pass along the west side of the arch; the new shop will be set back seven feet from it. We are greatly indebted to the Lincoln Co-operative Society for permission to watch the site as work progressed and particularly to Mr. Frank Jones, who is in charge of the work, for his keen interest.



A reproduction of Stukeley's drawing in "Itinerarium Curiosum," showing the Newport Arch as it was at the time of his visit in 1722. The east postern, here shown walled up, was, by public subscription, dug out and opened as a footway in 1826.

The New Alchemy

An excerpt from the address that the late Lord Rutherford was to have read before the Indian Science Congress Association (see p. 33).

Space restricts us to a notice of the most characteristic part of the Address, a brilliant and picturesque account of the recent technical advances in the methods for atom transmutation and the production of radioactivity, in which a copious supply of fast-moving charged particles is obtained by means of very powerful electrical machinery. Rutherford's own career in the world of nuclear physics is best summed up by the following vivid picture which he himself drew of the advance since 1919.

"In the one case, imagine an observer in a dark room with very simple apparatus painfully counting with a microscope a few faint scintillations originating from the bombardment of nitrogen by a source of α -particles. Contrast this with the large scale apparatus now in use for experiments on transmutation in Cambridge. A

great hall contains massive and elaborate machinery, rising tier on tier, to give a steady potential of about two million volts. Nearby is the tall accelerating column with a power station on top, protected by great corona shields. The intense stream of accelerated particles falls on the target in the room below with thick walls to protect the workers from stray radiation. Here is a band of investigators using complicated electrical devices for counting automatically the multitude of fast particles arising from the transformation of the target element or photographing with an expansion chamber, automatically controlled, the actual tracks of particles from exploding atoms.

"To examine the effect of still faster particles, a cyclotron is installed in another large room. The large electromagnet and accessories are surrounded with great water tanks containing boron in solution to protect the workers from the effect of neutrons released in the apparatus. A power station nearby is needed to provide current to excite the electromagnet and the powerful electric oscillators."

A Criticism of Ostwald's Colour Teaching

By M. Sargant-Florence

The teaching of Ostwald's colour system has been extensively practised in this country, without a full critical examination of its value and accuracy. It has the merit of having been exhaustively worked out by its author. But on close examination it is found to have many grave defects. Our article dealing with these is of great importance and interest to teachers.

THE introduction into England of colour teaching, based on Professor Ostwald's practical application of the 4-colour theory to the arts, is of quite recent date. Evolved by its author for the benefit of German painters and students engaged in the work of camouflage during the war, the translation of his works into English was not permitted until after his death, about 1930. It was then made available for readers here by Dr. Scott Taylor's translation, the first part of which was published in 1932, under the title of *Colour Science*, and it has become the standard reference work in the matter of colour training for children in Government and other schools, both primary and secondary.

No doubt this unhesitating adoption of a totally new and untried system was partly due to Ostwald's great reputation as a scientific chemist, together with the lack of any recognised agreement amongst theorists on the vexed question of colour appreciation and of æsthetic relations in their assemblage. Partly also its claim to be scientific closed the eyes of the authorities to the many fallacies apparent to those colourists who have given the system a trial. Its chief attraction to the teacher lies in the clear and efficient way in which the author deals with *achromatic* experience, which composes the first part of his work, and which is invaluable as a practical exposition of the laws underlying achromatic relations. But this has led to acceptance of the whole of his teaching without discrimination as to its value where purely *chromatic* sensations are concerned. Unfortunately, he assumes from the start that both Black and White are colour or *chromatic* sensations, a point of view at variance with the general acceptance of the term and of colourists' experience. It is, however, with the latter that my criticisms are concerned, particularly in regard to those æsthetic relations of colours which form the basis of successful hue grouping.

So far as European art is concerned no abstract principle determining choice in what may be called colour co-ordination has been consciously known to, or generally adopted by, painters or decorators in the art of colouring; procedure in that respect having been more or less by rule of thumb, and founded on tradition mostly derived from the East. The first recognition of the possibility of an abstract law governing

relations between the hues forming the visible spectrum, and which could be expressed mathematically, would seem to have been Newton's proposition of harmonic sequence in the ratios of the several groups of hues into which general opinion divides this sequence. This was early in the 18th century, and the controversy it aroused in the scientific world has not yet been settled. But three definite results have been born of this proposition, namely: the agreed adoption of the visible spectrum as criterion of chromatic beauty; the recognition of possible underlying relations between these groups other than the purely empiric ones of mere "taste" or of fashion; and the possibility of putting these relations on a scientific basis. Hence the sporadic efforts made ever since Newton's time, and the innumerable theories advanced in the effort to establish a working hypothesis.

Theories' Common Features

Of all the systems suggested, the so-called 3-colour and 4-colour theories, based on psycho-physiological data, hold the field at present, with, of course, the original proposition which seems somehow never to quite die out.

It is upon the 4-colour theory that Ostwald bases the teaching which I wish to examine from the colourist's point of view. At the outset, however, it will save time to enumerate the chief points which the three theories have in common. These are: the recognition of the continuous visible spectrum as containing within itself and exhibiting the whole range of pure hues perceptible to the human eye; the nominal acceptance of the spectral sequence as a complete octave, in the same sense that the musical octave is regarded as a complete unit, namely a series in which the initial and the final members are in the ratio of 1 to 2 (but it must be noted that this recognition is in effect only nominal, as will be shown later on); and finally the agreement to classify the infinite range of hues perceived by the eye in the spectrum into a small number of definite groups known as the *fundamental hues*. It is at this point that disagreement arises, and the question of the number of these groups differentiates in part the theories from one another.

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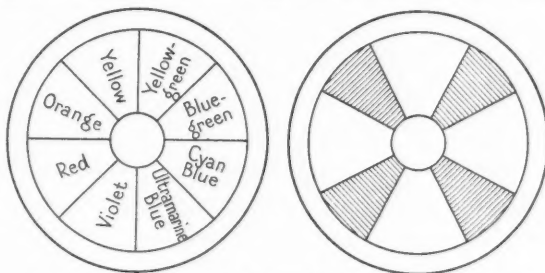
all, viz.: Red, Orange, Yellow, Green, Blue, Violet, further classification into 3 Primaries and 3 Secondaries (or derivatives) being made as a useful distinction, though generally discarded at present as misleading and not applicable to an odd-numbered sequence such as the Newtonian where the division is one of seven in number: Red, Orange, Yellow, Green, Blue, Indigo, and Violet. On the 4-colour theory there are eight groups which Ostwald gives as: Red, Orange, Yellow, yellow-Green, blue-Green, cyan-Blue, ultramarine-Blue, Violet. Here the introduction will be noted of an extra green and an extra blue into the 8-hue sequence. This may not be considered of outstanding importance at first sight, but with subdivision into 16, and further multiples of 8, the preponderance of the cold over the warm hues makes itself increasingly felt. In the hue chart of his *Colour Primer*¹, where the circle is divided into 24 parts, the cold members from greenish-Yellow to blue-Violet, both inclusive, occupy exactly one-half of the whole series. As subdivision is carried further the cold region outstrips the warm, a result contrary to general appreciation of the spectrum, and inevitably leading to a harsh and sombre character in colour schemes based on this theory. As an illustration we may compare the glow of oriental rugs and fabrics, where warm hues predominate, with those which are the product of modern European looms.

A Hiatus in the Circle

Following the example of most scientists when desiring to illustrate hue relations, Ostwald adopted the colourists' traditional diagram, the "Chromatic Circle," by which to demonstrate his theories. But on examination of the face value of the diagram, he came to the conclusion that the spectral range of hues falls short of an octave of wave vibrations, and in consequence a closed circle does not fully represent the relations of its members to one another. Calculated in terms of wave vibration, he estimated that a hiatus of $1/5$ th of the circumference separates the two extremities, Red and Violet. In order, however, to retain the traditional diagram, for the benefit of the colourists, and satisfy the normal demand for the retention of red-Violets and Purples as spectral hues, he proceeded to fill up this hiatus by variously graded mixtures of the two extremities and to "rationally divide" the whole series into uniformly equal parts. But if, following his analysis, such mixtures are compounds, they cannot enter into the category of *pure* hues which, by definition, compose the visible spectrum. He continued, however, to employ this composite range of hues as the basic diagram with

which to demonstrate his system of relations, practically treating the series as a pure-hue octave unit. Doubt, however, must arise as to whether this basic diagram still holds good, or whether, on the other hand, the results of his observations are consistent with the standard of colour vision generally accepted. The insignificance of the red area, so prominent a feature in his chromatic division, raises the suspicion of defect to that hue in the vision of the investigator, a suspicion strengthened by the excess of the green areas upon which he insists.

This point of view is interesting when taken in conjunction with a remark in his *Farbkunde*, namely, that: "among the investigators who occupy, or have



Ostwald's system: eight-hued dial (left) and tetrad slotted disc, with the slots shaded.

occupied, themselves with Colour Theory, an astonishing number can be found with an imperfect colour sense. The explanation of this appears to be that, owing to conflicts of opinion with their associates in respect of Colour, their attention has been directed to this domain with particular strength."²

Ostwald's instructions in his manuals, though intended for practical painters dealing with pigments, that is to say, working in terms of *remitted* light, were mostly based on investigations made in the laboratory with *transmitted* light for the purpose of obtaining results unaffected by material, *i.e.*, atmospheric dirt, and which could be measured by wave-lengths. One of the most striking differences in the behaviour of these two kinds of light is apparent on the admixture of any two pure hues standing at certain distances apart in the spectrum. In both cases the colour itself changes to one intermediate between them; but in the case where two monochromatic rays of light blend, the immediate result is a great increase of luminosity, with proportionate decoloration. In the case of pigments, *i.e.*, remitted light, the product of mixture shows as a *lowering* of tone values. The modification here, however, is generally so gradual and incomplete that, under the title of Tertiaries, or broken hues, such, for instance, as Olives, Browns, Russets, etc., their production arouses no

¹ *Die Farbenfibel* p. 19, reproduced in *Colour Science*, Pts. I, II, and III.

² See Scott Taylor's trans.: *Colour Science*, p. 83.

marked feeling of surprise. Hence, in remitted light the mixture of a complementary pair, which gives total discoloration with a resulting neutral grey, does not attract particular notice. With transmitted light, on the contrary, the startling effect of a high degree of luminosity with immediate loss of colour on blending complementaries arrests attention and intrigues the observer. Hence, probably, the amount of interest shown by scientists in this particular interval, and the lack of it in the less obvious transitions which occur in the mixing of pigments, but which are non-existent in transmitted light experience. To painters these tertiaries are of supreme importance as supplying the major portion of their colour material. But in Ostwald's system it is evident that they do not enter into his consciousness, to judge from the letterpress and charts, though he claims that the whole field of chromatic sensation is covered by, and is represented in, his system.

Dark-toned and Light-toned Colours

On analysis of his colour charts, it will be found that all variations in tonality values are shown as directly due to the use of more or less Black modifying the initial hue. It is true that he makes a distinction between those modified by Black only, which he calls "dark-toned" (*dunkel-klaren*); those modified by white only, *i.e.*, "light-toned" (*hell-klaren*); and those which result from the addition of both Black and White, named "turbid" (*trübe*) colours. This limitation in tonal resources is borne out by all the illustrations throughout his various textbooks on Colour, and the letterpress gives no indication that it is due to the need for economy in reproduction. This point of view may be, possibly, the logical outcome of the hypothesis which regards Black and White as chromatic sensations, though Ostwald classifies them as "achromatic colours" (*unbunte Farben*) and excludes them from the spectral series. It is more probable that in the necessarily large-scale practice of camouflage, with its coarse effects, the desired tone grading is far more easily measured by amounts of Black and White than in terms of colour mixture. Further, the subtler effects of the latter would be lost sight of at any great distance. But these conditions do not hold in ordinary pictorial painting, nor in classes where eye training is the main objective. Incidentally, it is true, he refers to higher light values being obtainable in water-colour, presumably on white paper, by thinning with water only, but adds the remark that "this amounts to much the same thing as adding white!"³

But tertiaries form an indispensable part of painters' material, and it is difficult for them to realise that

³ *Farbenfibel*: Sect. II on "Buntesfarben."

a system of teaching on these lines should have been so hastily adopted and apparently without remonstrance.

It may, of course, be contended that the foregoing strictures concern matters mainly of interest to the trained and sensitive vision of the artist. That, for example, the distinction between *broken* and *degraded* hues is not generally perceived even by the intelligent public. Further that questions of hue balance in the spectrum depend on individual taste, and the preference for Greens and peacock-Blues may be distinctive of northern races heralding a new departure in colour designing. To the former objection the reply must be that all training, whether of eye or of ear, is supposed to aim at the highest standard in developing the sense with which it deals, whilst the latter point of view must be met by reference to the æsthetic quality of results obtained. When, however, we come to gauging the capacity of this system to make full use of all spectral hue material in chord-building, the problems involved are placed on a simple arithmetic basis quite apart from any æsthetic approach.

Geometrical Presentation

Now, the principle of uniformity adopted by Ostwald as the basic principle of his system when applied to chord-building, equally implies bilateral symmetry, inasmuch as such groups are diagrammatically presented in the form of equilateral figures. Thus, for example, in Ostwald's triad or group of 3 hues the members stand at the angles of a triangle; in a tetrad they are placed at the corners of a square; in a 5-part chord at those of a pentagon. This geometrical mode of presenting colour chords is in general use under whatever system employed, for chord indicators mostly take the shape of a movable disc, of the same size as the chromatic dial to which it can be applied so as to rotate round a central axis. Each chord is represented by a separate disc, which is slotted in such a way as to expose the given number of hues and the required spacing between them. In a triad disc, for instance, the slots will be cut at three points from one another and so as to overlie the spectral band of the dial; in a tetrad, the slots will be at four points; in a hexad at six, etc. The value of a movable disc is that on rotation each combination of hues which forms a chord will be visible in turn through its appropriate slots, and by this means, however great the subdivision of the visible spectrum, the whole hue material should be available for use. But in the system both of uniform division throughout the sequence, and of bilateral symmetry in the chords themselves, the possible combinations become severely restricted, as is evident on application of such discs to an 8-, or to a 16-part division of the spectrum series. It then becomes

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obvious at once that short of 24 divisions, Ostwald's prototype triad, based on the equilateral triangle, could not indicate a chord of three *whole* hues, but would only show one of two *whole* and two *part* hue-areas, i.e., the third angle would fall upon the border line between two neighbouring members. In the case of a pentad the same difficulty would be present in any division below that of 40 hue areas. Now it is mostly by the 24-division chart that Ostwald demonstrates his mode of group construction but, as it is the one which lends itself most successfully to both the odd- and even-numbered groups generally in use, the short-comings of uniformity in this matter are ignored.

Repetition of Chords

Further practical use of the discs makes it apparent at once that still greater restrictions than the foregoing are imposed when the principle of uniformity governs throughout, for it will be found that the number of combinations possible to each chord is strictly limited. Thus, for instance, in the octave of 8 fundamental hues a tetrad can vary only in two ways, as is evident in the series: Red; Orange; Yellow; yellow-Green; blue-Green; cyan-Blue; ultramarine-Blue; Violet. On the application of the disc slotted on the Ostwald plan of a square we can only obtain:—

Tetrad (1) = Red/Yellow/bl.-Green/ultr.-Blue.

Tetrad (2) = Orange/y.-Green/cy.-Blue/Violet.

Tetrad (3) = Yellow/bl.-Green/ultr.-Blue/Red = No. 1.

Tetrad (4) = y.-Green/cy.-Blue/Violet/Orange = No. 2.

and so on in alternate repetition. Increase in the number of subdivisions will naturally increase the number of chords possible but only in strictly proportionate ratios.

In a system where no question of precedence distinguishes one unit value from another, variety, by means of permutation, cannot be introduced. Thus the chord tetrad (1), above, read in different order becomes tetrad (3), and tetrad (2) becomes tetrad (4). The order may change, but not the character of the chord. The limitations inherent are not difficult to calculate, or they can be tested by means of the rotating discs device; in either case the results obtained bear evidence to the meagre results in hue grouping of this system. Ostwald himself seems to have been aware of this fundamental defect in symmetrical uniformity for, after having established the principle in the earlier part of his work, he goes on to suggest an indirect method of choice so as to produce what he names "defective chords." These are derived from any orthodox group of not less

than three in number, by the subtraction of one or more members. He claims that if from a triad one hue be left out the harmonious effect still remains⁴, citing as example the pair of hues which on his circle of nominally 100 divisions stand respectively at 00 and 33 degrees, i.e., at yellow-green and red. But this example is of little value as the real question of harmonious relations arises initially with the introduction of a third member, as Viollet le Duc pointed out.⁵

Ostwald's Pessimism

Chords of higher numbers such as tetrads, pentads, hexads, etc., by shedding one or two of their members will, it is true, produce groups of greater numerical complexity than that of mere diads, but he gives no indication of the lines upon which to proceed in the choice of the members to omit. The rigid rule of symmetry and uniformity no longer holds, yet no other principle seems to be suggested. It is unfortunate that Prof. Ostwald should not have worked out more definitely the results of his methods of chord-building, but left this to his followers amongst the painters, whom it vitally concerns. On the other hand he may have felt baffled by the barrenness of results, for he concludes his *Colour Primer* with the remark that, "It is in the highest degree unlikely that all the possibilities of colour harmony are exhausted by the principle of equi-distant points round the Chromatic Circle, which lies at the root of the foregoing discussion. With far more reason it may be surmised that still other laws governing the choice of hues may lead to yet more striking effects of colour harmony."⁶

The irrelevancy of applying the term "chord," which in its musical meaning implies an organic structure built up on harmonic principles, to an assemblage of units indicated by quite a different line of reasoning, is common to most of the colour theories. But in one sponsored by a scientific authority and claiming a scientific approach to æsthetic colour theory, the misuse of this term appears to be only another instance of the lack of logic so apparent throughout most of the systems advocated. Unfortunately, the general desire for a universally accepted theory, upon which class instruction could be firmly based, has led to the hasty adoption of one which had never been tested seriously by trial and error. The merit of Ostwald's chromatic work lies rather in the painstaking and detailed exposition of his views than in the value of their results, and in bringing into the open a subject hitherto mostly confined to theoretic discussion.

⁴*Farbenfibel*, p. 44.

⁵*Dict. de l'Architecture*: article "Peinture"

⁶*Farbenfibel*, p. 44, 3.

The Argument from Flight

Are flying animals autonomous in their flight? Dr. Wheeler, with his experience of flying, argues that the necessity for many simultaneous functions during flight proves that they must be. A statement of the mechanistic point of view would be of the highest interest, and our readers are invited to state their views on the matter.

THE mechanism of wing muscles and allied structures can of course be described in physico-chemical terms, and the development of aeronautics as a triumph of applied mathematics and physics. But a new and independent argument for vitalism is to be found in the autonomy of the flying animal considered as a whole organism. It is derivable directly from the innumerable experiments continually made under natural conditions by birds, bats, and flying insects, and from the experiences of those human beings who perform analogous feats in aeroplanes. This confirmatory evidence, however, cannot be properly appreciated by mere passengers in aircraft. The argument therefore is less likely to attract biologists who cannot pilot aeroplanes themselves; but it should appeal to all scientists who have qualified as pilots, especially under Royal Air Force conditions. When I did this, at the age of thirty, in 1918, pilots had to be able to fight, read and send signals, make observations, take photographs, drop bombs, and so forth, as well as manage their machines; and we had not the modern advantages of slotted wings and wireless apparatus for receiving information.

Under such conditions the pilot was very similar to a flying animal such as a bird, which, besides flying without disaster, has also to keep its direction, look out for food or prey or friends, avoid enemies, and so forth. All this is much more complicated than merely flying in still air, which in itself is of about the same complexity as walking, save that the flier cannot stop or slow down beyond a certain limit. The correct performance and correlation of all these functions, which have to be carried out very quickly as well as accurately, is, I maintain, impossible for a mere mechanism, and proves autonomy in the organisms concerned. It is immaterial to the argument that flying is certainly instinctive in insects, at least in those, such as butterflies, which hatch out singly without parental supervision at any stage, but in many young birds is also partly an educational process.

This argument is strengthened when we consider the great skill shown by Amathusiid butterflies and similar organisms, which fly nimbly and with little or no damage to delicate and relatively large wings amid the hard and spiny intricacies of dense tropical jungle. Yet so far the reasoning is similar to that of E. S. Russell and other students of animal behaviour (*Behaviour of*

Animals, London, 1934), except that the evidence for autonomy is intensified in flying animals.

But landing is the chief test of an embryo pilot, and also of the superb skill of flying insects and birds, and especially of animals that fly in the dark, like bats. Granted that flying organisms can check their speed before alighting in a way only possible at present to such human specialities as helicopters and autogiros; yet it is a daily marvel that they land unerringly on twigs, flowers, and other objectives, often unknown "landing grounds," and under variable wind conditions which preclude any sort of reflex action and demand adjustment to different circumstances in almost every case. This is particularly striking when insects and birds whose speed is twenty-five miles an hour or less manage to alight safely in winds blowing at higher speeds, a feat which was beyond human skill in my flying days.

Mechanistic Flying

It is of course to be remembered that these flying animals, even including many insects, fly quite autonomously with respect to the wind. Mechanistic "flying" or, rather, drifting with the wind, is seen in air-borne seeds and fruits, and is entirely different from the aerial progression of vertebrates and insects. Plants, like inanimate matter, possess no autonomy as regards aerial transport.

If it be objected that nowadays human flying is largely "mechanical," that, by means of improved instruments and information received by wireless, aeroplane flights can be successfully accomplished now that would have been unlikely or impossible only a few years ago, two remarks may be made. Firstly, this does not effect the preceding argument, based upon human flying conditions at the close of the Great War. Secondly, all the mechanisms by which mankind has achieved controlled flight in heavier-than-air machines are devised and employed by human intelligence and will, and would of course be non-existent without these; even a pilotless, "wireless-controlled" plane remains a man-controlled plane, and the whole development of aeronautics is mechanical and physical only in a secondary sense; essentially it is yet another demonstration of the autonomy of mind.

Finally, this argument is based upon ordinary flight and calls for no support from the phenomena of migration, which, in my opinion, form at least what Driesch would call an *indicium* if not another distinct proof for autonomy in flying animals (cf. F. W. Frohawk, p.23, *Complete Book of British Butterflies*, London, 1934).

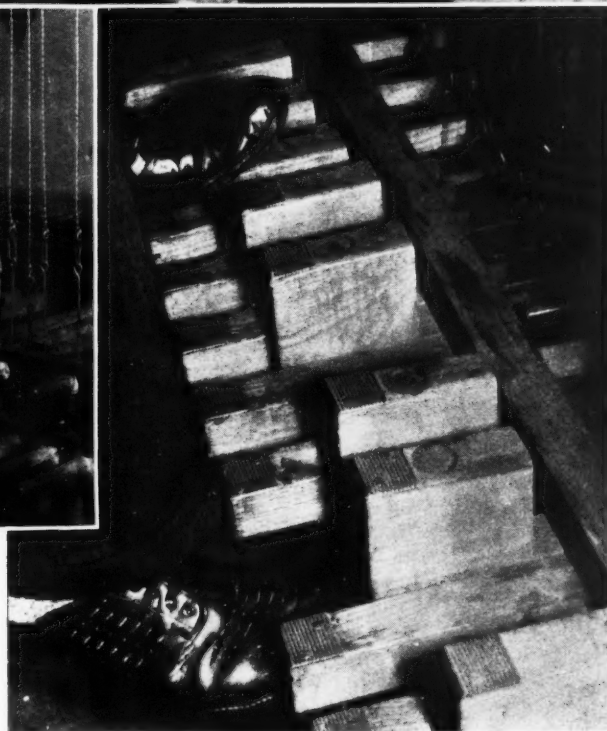
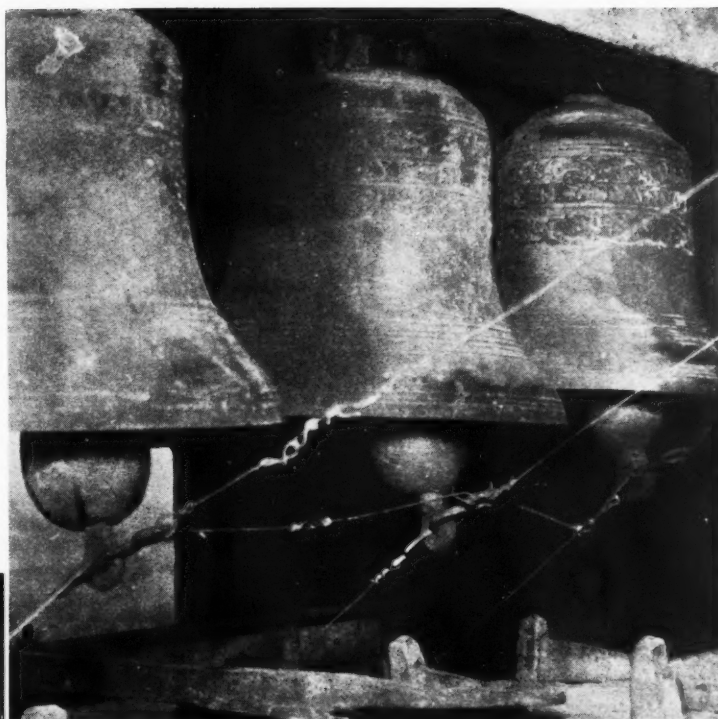
L. RICHMOND WHEELER, M.Sc., Ph.D.

THE CARILLONS OF HOLLAND

Mediæval Tradition Still Flourishes

FOR the fullest development of the art of bell playing, we must look to Holland and Belgium, where this practice, flourishing to-day, is deeply rooted in mediæval tradition. The national interest in the carillon is well demonstrated by the fact that towns and villages in Holland still frequently erect new towers equipped with bells, and their pleasant chimes are to be heard in all parts of the country.

Before there can be bell-players,



The photographs published here were taken in the carillon tower of Nijkerk, a village in the province of Gelderland, on the border of reclaimed land in the former Zuyder Zee. Where once the chimes of the bells were heard by fishermen passing to and fro in their vessels, they now charm the ear of the farm-workers in the fields.

there must be bells, and so the initial development of the carillon was vested in the bell founders. Probably the most famous were the brothers P. and F. Hemony, who reached the peak of success about the middle of the 17th century. Their carillons were sold all over the world, and for many years the name of Hemony was almost as celebrated in music as that of Stradivarius, the famous maker of violins. To-day the name of Hemony is remembered only by a few who take an interest in the history of the carillon, but the art of playing the bells thrives as strongly as ever.

Bell playing nowadays owes much to Jef Denyn, who founded a famous school for carillonneurs in Malines. His tuition influenced bell players throughout Europe, and many pupils from his school found their way to Holland, where the art is so widely practised to-day.

An examination of the mechanism of the carillon reveals a fairly complicated system of wires and levers, as shown in our first illustration. Each clapper is connected by a wire to a lever on the "keyboard." The clapper has also a restraining wire on the opposite side so that it is under perfect control. In addition to this the clappers are in many cases linked one to another by means of wires.

Considerable attention has to be paid to the operating wires, in order to ensure that the correct length is maintained. The carillonneur obtains gradation in tone by varying his "touch," and it is, therefore, essential that the connecting wires should always respond in the same way to the movements of the levers. In our second illustration it can be seen that the "keys" are in reality large wooden projections—the ends of the levers—and these have to be depressed quite a distance, and with considerable force, in order to play the bells. This is done by means of the clenched fist, and it is necessary for the carillonneur to be possessed of strength, especially in the wrists and forearms.

As already mentioned, variations in the force employed produce variations in volume of sound, and the skill with which such gradations of tone are obtained can be realised only on hearing a performance by an expert player. It is really amazing that such an apparently clumsy contrivance can prove so responsive in the hands of an expert.

The technique of the carillonneur does not stop at manual dexterity. His feet, too, are busily employed in operating pedals which control some of the larger bells. These levers are even heavier than those operated manually, as can be seen in the third illustration. However, although strength is required in the legs and feet, the bell-player learns how to perform this part of his work with minimum effort, and suffers comparatively no more fatigue than the trained cyclist or swimmer.

The World Calendar

Again last year the League of Nations at its annual assembly considered the question of calendar reform. It is a matter of considerable, though not vital, interest to the work and harmony of the world, and we will say a word about it later on. But, before approaching a reformed calendar, it is well to understand something of the calendars already in existence and how they have come to be. This is one of the most fascinating and profoundly significant subjects in history and it is fortunate that we have a competent and extremely interesting book just to hand, at the moment when Geneva is turning again to the task. The general book to which we refer is by Mr. P. W. Wilson¹, an English writer with strong American connections and sympathy; and we ought to add to it a smaller and very scholarly book by Mr. F. H. Colson² on "The Week." The smaller book supplements the larger on a limited but intensely interesting part of the whole subject. It is not clear that Mr. Wilson has consulted it, and it would have added greatly to the scholarly value of his book if he had given a list of a few at least of his authorities. Mr. Colson does, and adds thereby both to our confidence and the vista of our knowledge.

Light on Human History

The extraordinary historical and human interest of the calendar arises from the fact that it binds together so many strands both of scientific and religious thought, and of the practical needs of men in living and working together. The story is of how larger and larger numbers of men have come to agree to a system of divisions of time which in the last resort are based on movements of the earth and other astronomical bodies in space. Thus measurements of time and space are brought together and ordered by human mind, for human convenience. The question touches some of the deepest riddles in our existence as well as the most frequent and even trivial occurrences in our daily life. In this way calendar-making is unique; less spontaneous than language-making, it is more scientific, for it has from the first a basis in the objective observation of nature on which all science rests.

When was this "first" in the making of calendars? If we mean by this, the first publicly promulgated and accepted calendar, the beginning is coincident with civilisation; one might, indeed, use the event as the test of the beginning of civilisation. If we mean the beginning of the elementary observations on which the

1. *The Romance of the Calendar.* By P. W. WILSON. (Allen & Unwin).
2. *The Week.* By F. A. COLSON. (Cambridge Univ. Press)

calendar is built, this is lost in the mists of the origin of man's reasoning about nature. As soon as he begins to order his life by the observation of the regularities of day and night, the seasons or the phases of the moon, the basis of the calendar has been laid.

The movements of three bodies in space are concerned, and Mr. Wilson, in his lively and instructive volume, traces for us the course of the debates which for ages divided mankind as to how these three independent movements were to be reconciled. The earth revolves on its axis and gives day and night. This is the primary calendar fact which has to be fitted into the observed movements of the other two, the sovereign of the day and the regent of the night. Mr. Wilson brings out well the long duel which raged everywhere between sun and moon as the director of the calendar. Everywhere men began to order their time by the phases of the moon; everywhere in the end it was the sun which won.

The Egyptians, the Romans (under Julius Cæsar), and the Catholic Church (under Gregory XIII), have, in the end, brought mankind together in their method of measuring time. It is the most signal triumph in unification which history records and should be studied in all its interesting details, especially in days when unification of other sorts is so hard to reach. The story is in this sense a great encouragement, while its stages bear evidence to the growth of scientific observation and the gradual triumph of science and practical usefulness over all the relics of superstition, sectional peculiarities and sentimental conservatism of which the calendar is still full. Broadly speaking, as everybody knows, our present agreed Gregorian calendar has been reached by fitting in the days into the solar year, which is exactly 365 days 5 hours 48 minutes and 46 seconds. The Julian year called it 365 days and 6 hours, which was some 11 minutes too long. This had amounted, in A.D. 1582, to a discrepancy of 10 days, which was corrected after much discussion on the authority of the Pope Gregory XIII. The months, which, as their name testifies, arose first from lunar revolutions, have, since the time of the Romans, lost any direct connection with the moon, and remain as convenient divisions of the year for the sake of business, dating, etc. Their names are a curious and rather ugly collection of Roman deities and emperors. The week also is a quite arbitrary division primarily arising from the Babylonian and Jewish Sabbath, which, by popular usage, somewhere just before the Christian era, got fitted into a sequence of days named after the planets. All this is told clearly and with scholarly precision in Mr. Colson's little book. The story is even more interesting than that of the month, because the week seems to have become adopted without any official injunction, purely by the growth of

popular opinion and usage. The seventh-day rest was a humane convenience, apart from the Jewish law about it, and the then-known planets—including the sun and moon—gave the framework. This was due to the astrological belief in the governance of each hour by one of the heavenly bodies. But for details of how this was worked out in practice the reader must refer to Mr. Colson.

The Reformed Calendar

What is it that the calendar reformers propose and why do they do it? They would give us a uniform year and months arranged in the year as nearly uniformly as is possible, if we retain the division into twelve months. Comte, in his Positivist Calendar, gave thirteen months of 28 days, divided into four weeks of seven days. But this would destroy the half-year of six months and the quarter of three. So the present-day calendar reformers retain the twelve months and rearrange them in quarters, each beginning with a month of 31 days followed by two months of 30 days each. Thus:—

January ..	31 days	July ..	31 days
February ..	30 "	August ..	30 "
March ..	30 "	September ..	30 "
April ..	31 "	October ..	31 "
May ..	30 "	November ..	30 "
June ..	30 "	December ..	30 "

This gives us the same total as the thirteen equal months of 28 days each and leaves a day over each year which the calendar reformers would have as a holiday and call it "Year End Day." Comte would have made it the "Day of All the Dead," adding a solemn and religious touch to the holiday. In the same way, the extra day for Leap Years, which the reformers propose to put in the middle of the year, Comte would have celebrated, also at the end, under the title of the "Festival of Holy Women." Mr. Wilson, who gives the most convincing and attractive case for the change, has no illusions as to the difficulty of attaining it. Already we have seen a Sabbatarian outburst launched by the Chief Rabbi in *The Times*. Mr. Wilson, by anticipation, has an excellent chapter answering it, through the Sabbatarian point is so extreme and unreal that most readers will hardly feel the need of dealing with it so elaborately. But one knows how deadly a determined minority may be in preventing a reform.

It will be seen that the subject has profound significance in the history of the human mind and a lively topical and utilitarian interest at the moment. Under all headings it deserves study and Mr. Wilson is a reliable guide of engaging manners.

F. S. MARVIN.

Social Science and Philosophy in the Universities

By Morris Ginsberg

By courtesy of the Editor of the Sociological Review, we are able to reprint Dr. Ginsberg's important criticism of the teaching of social science and social philosophy at the universities, originally read last year to Section L of the British Association. Dr. Ginsberg strongly deplores the system of watertight compartments into which these subjects are divided and holds it largely responsible for the present confusion of thought on social problems.

AN examination of the courses of study now followed in the universities shows that the teaching of the social sciences is almost completely divorced from the teaching of social philosophy. The bulk of the students reading economics, anthropology, history, law, international relations obtain no systematic training in philosophical analysis, and they are encouraged, no doubt in the interests of objectivity and detachment, to regard their disciplines as ethically neutral. Politics is perhaps an exception. Though it consists mainly of a factual study of methods of governmental administration it deals also with the theory of political obligation and with the ends or aims of government. Yet even in the case of political science it is true, I think, that the majority of students are rarely given the preliminary training in ethical analysis necessary for any effective synthesis of these two aspects of their studies. Where, as in Modern Greats, philosophy is associated with economics, politics, and history, there is likewise no clear evidence that any genuine correlation is achieved.

Value-Fact Relationship

As a preparation for the effective handling of social problems, both from the point of view of theory and practice, the schemes of study now prevalent seem open to grave objection. The problems of deepest interest to layman and student alike are just those in which questions of value and questions of fact are closely interwoven, and to see them in their proper relationship is a matter of the most vital importance to the social inquirer. In political discussion it is not uncommon for questions of right and wrong to be overborne by confident assertions as to facts which themselves turn out to rest on little more than prejudices. It is no doubt equally the case that sociologists have often been influenced in estimating the trend of events not so much by the evidence before them as by their preconceived theories of the direction in which events ought to move. It is, therefore, essential that questions of fact and questions of value shall be clearly distinguished. The training at present provided in the universities is not, however, well calculated to achieve this object. For while students are given careful instruction in marshalling and correlating factual data they have no parallel experience in weighing values or in disentangling the value elements in complex social situations. The result

is that they hover between scepticism and dogmatism. They either conclude that moral judgments do not permit of rational analysis but are matters of taste or feeling about which there can be no argument, or else they accept uncritically the now fashionable dogma that value judgments merely express the needs of the dominant sections within any given community. In moments of crisis, that is to say, at times of profound conflict of loyalties, the moral assumptions underlying conduct are put to the test and the lack of systematic reflection becomes painfully evident in the tangle of contradictions then brought to light.

Functions of Social Philosophy

Social philosophy has two functions to fulfil, both of special relevance and urgency at the present time. The first, which may be described as the logical or epistemological, is concerned with the presuppositions or assumptions underlying common-sense and scientific thought about social phenomena, and with the nature and validity of the methods employed in investigating them. It is true that in the past controversy as to methods of investigation has sometimes blocked the path of investigation, and sociological treatises in particular have often been accused with some justice of spending so much time on questions of the logic of their inquiry that the inquiry itself is never undertaken. It is further true that philosophy can no more prescribe the methods to be employed by the social sciences than it can prescribe the methods to be employed by the physical sciences. But philosophy can, and it seems urgently necessary just now that it should, attempt to provide a critical apparatus for scrutinising and evaluating the methods and assumptions made by the social sciences, and particularly the more fundamental conceptions from which a synthesis of the social sciences might proceed. I will give some examples in illustration of this need.

In the last century the conception of evolution was part of the climate of opinion. It was a constitutive principle of thought, and all problems were naturally approached within the framework of evolutionary theory. Gradually a reaction set in. In part this was due to the failure of the ambitious efforts made by earlier sociologists like Spencer to build up schemes of evolution covering the whole range of human activities. In part the reaction was of the nature of a protest, which had its

parallel among the biologists, against excessive pre-occupation with problems of origin or genesis, and expressed the desire for a direct study of existing societies. But above all, it was due to a decline of faith in the notion of progress with which evolutionary sociology was associated, a decline of faith brought about by the eclipse of humanitarian ethics and the triumph of the opposite principle of forcible self-assertion in its various forms. The position now is very curious. People are sceptical of the possibility of establishing any general laws of social change, yet cannot reconcile themselves to the view that in history there is no plot, rhythm, or pattern, but only a series of emergencies, the play of the contingent and unforeseen. In the form of the materialist interpretation of history the notion of development, so far from being dead, is exerting a wide and growing influence. The biological form of the theory survives in racial theories of civilisation and in the widely held view that in history the struggle for existence is the decisive force. Very few writers can avoid using the conception of levels or stages of civilisation, though the criteria for comparing different peoples or periods are rarely stated explicitly. The question thus remains whether the notion of evolution or development is valid as applied to societies, whether it is used in the same sense when applied to different spheres of human activity, say, economic and political institutions, religion, art, and morals, and how it is related to the conception of progress with which, despite much discussion, it is still frequently confused. A philosophical analysis of the conceptions of social change which in fact are employed, whether deliberately or otherwise, in the different social sciences would greatly help in clarifying the present highly confusing state of affairs.

The "Collective Will" Problem

Another problem calling for philosophical reflection relates to the part played by the human will in social change. There was a time when the possibility of any social science was disputed on the ground that the freedom or indeterminateness of the will made the notion of regularity or law inapplicable to human affairs. Now the tendency is rather to doubt the efficacy of the human will on the ground that the social process is determined by massive causes which operate independently of the will of individuals. Apart from the support given to this view in some forms of historical materialism, it underlies much recent popular thought. It is implicit, for example, in the statement frequently to be met with that war is "inevitable," despite the fact that no one wants it. The fatalistic attitude is encouraged by the enormous complexity of the factors shaping collective action which does not appear to be

the result of any individual will, nor of a common will, but rather of a complicated network of wills linked in a manner not willed by any one. From the fact that the interactions between wills are not controlled by any one will the conclusion is drawn that will does not count at all. Or else, paradoxically, refuge is sought in the unique will of a "leader" credited with the power of solving by sheer self-assertion all the problems which had baffled the collective wisdom of the community. I am not suggesting for a moment that the problem of the nature of public opinion or of collective volition can be solved by philosophy alone. On the contrary, these are matters largely for sociology and social psychology. But philosophy can throw light on the validity of the notion of end or purpose in its application to the historical process, and on the problem whether the laws or generalisations of the social sciences assert relations independent of the human will, or consist rather of statements of the various ways in which human wills act in relation to each other under assignable conditions. While the laws themselves have to be established by empirical investigation, the philosopher can do much to guard against confusions likely to arise out of misunderstandings regarding the logical character of the laws and the relations between necessity, freedom, and law.

Induction and Deduction

One further illustration may be given of the need for philosophical analysis suggested by the present position of the social sciences. There has been a great deal of criticism lately of the use of the abstract or deductive method in economics. This criticism seems to me on the whole to be misdirected. There can be no question of the legitimacy of the method in its own domain or of the importance of pushing it as far as it will go. The really important question is rather as to the relation between purely deductive studies and the more concrete or inductive handling of economic data. Here there appear to be real divergencies of view which urgently require elucidation. There are some who regard the laws of economics as analytic propositions bringing out the implications of certain fundamental conceptions, for example, of what is involved in the notion of scales of preference in relation to goods limited in supply. Induction is then not considered as having a verificatory function: the business of empirical studies is rather to reveal the fields within which theories otherwise established may be applied, or perhaps to suggest new or residual problems. Other economists regard economic laws as hypothetical generalisations to be verified by appeal to the facts, and induction and deduction are then regarded as integral parts of one set of logical operations. My experience of students suggests that

they are bewildered by this divergence of views, and that they are seldom able to bring together the results of economic theory and of empirical observation. Whether a particular method is useful or not cannot be determined by abstract speculation but only by experiment in actual investigation. Yet some grasp of the logical aspects of the methods employed would be helpful to the student in his present bewilderment.

Ethics and Economics

So far I have referred only to the critical or logical side of social philosophy, but the more positive side, namely, that concerned with the problem of values, is now of even greater importance. The social sciences have recently prided themselves on their ethical neutrality, and they insist that they are concerned not with things as they ought to be, but as they are. There can be no doubt that much confusion has been caused by a failure to observe this distinction, and in so far as the present attitude of the social sciences is intended to guard against this confusion there is clearly much to be said for it. Yet I am not sure that the grounds of the distinction have been accurately stated or that the ethical neutrality is observed in practice. In the case of economics it has been made to rest on the distinction between means and ends; economics is said to be concerned solely with means, while the problem of ends is left to ethics. This is clearly untenable. Ethics cannot ignore means and economics cannot ignore ends, since the efficiency of means cannot be ascertained without reference to the ends they serve, and the compatibility or coherence of the various ends depends in part on the compatibility and coherence of the means. The true distinction seems rather to be that economics deals with ends hypothetically. It answers the question: if the end were so and so, what must be done in order to attain it? Ethics, on the other hand, is concerned with the more radical question as to what ends ought to be chosen. If confusion is to be avoided the two questions must be clearly distinguished. In the criticism of a particular form of economic organisation, for example of capitalism, it is important to be clear whether we are dealing with the question whether capitalism is efficient or inefficient in attaining its objects, or whether we are questioning the desirability or value of these objects. But while it is important to distinguish the questions it is no less important to ask them both, and I would venture to say that it is the moral issues involved which at present are most urgently in need of clarification.

From this point of view a second ground which is often given for the separation of ethics from social science is even more open to objection. It has been argued that

economics must eschew all problems involving value judgments on the ground that these are not open to investigation by scientific methods. I suggest that this argument begs a serious philosophical question, and that so far from being ethically neutral commits itself without proper inquiry to a particular form of ethical theory, namely the theory that moral judgments express nothing but personal feelings. If, as is presumably the case, the reference is to teleological ethics, it is easy to see that the ends of behaviour cannot be ascertained by simple inspection. To determine the ends of social policy or the purposes of social institutions is an even more complicated matter, and whatever may be our view of the nature of ultimate valuations, there is much to be done that calls for careful and methodical investigation in bringing these ends to light in relation to the means available for their realisation. The distinction between means and ends is itself far from clear, and in many cases (*e.g.*, the desire for power) it is certainly not easy to tell by simple inspection whether we desire a thing for its intrinsic value or as a means for something else.

The Ends of Social Institutions

I am not maintaining that these are matters for the economist, or that the distinction between means and ends taken as given is not serviceable enough for his purposes. But he goes beyond his province in suggesting that the ends of social and economic institutions do not permit of rational discussion, or that in dealing with differences of view regarding them we are reduced to assertion and counter-assertion. Leaving aside the questions of means, three different questions arise in connection with social institutions: what ends do they in fact serve, what ends are they intended to serve, and what ends ought they to serve? He would be a bold person who were to claim that these questions can be adequately dealt with without painstaking and methodical inquiry in relation, say, to the various forms of the family, of property, of war, or of the criminal law. It is clear that in a great many cases our moral judgments of particular institutions would be transformed if we had fuller knowledge of the ends actually attained in relation to the ends they are intended to attain. The moral judgment itself is far from simple, and I can see no ground for assuming that it is not susceptible of investigation by rational methods, whether such investigation be called scientific or not. I agree that economics and sociology in general should be kept distinct from ethics, but would urge that they should also be brought into definite relation. Confusion is likely to arise if their distinctness is not recognised, but also if they never meet at all. The effective handling of social problems involves a synthesis, but not a fusion,

of social science and social philosophy. If this be so, then the present organisation of teaching in the universities is sadly out of balance.

The need for closer co-operation with social philosophy is even clearer in connection with the teaching of political science and especially of international relations. In politics attention is largely concentrated on the institutional side. The ethical aspects are generally introduced through courses on what is called the history of political ideas. As I have already indicated, students seldom have the necessary preliminary training in the analysis of ethical concepts which is essential if the facts of governmental organisation are to be effectively correlated and interpreted in the light of the ends which governments subserve or ought to subserve. I doubt, for example, whether they are equipped with the critical apparatus needed for dealing with such questions as the relation between the good of the nation and the good of its constituent members, or of the relation between loyalty and conformity, or of the legitimacy and limits of the political use of force. In the teaching of international relations ethics plays, so far as I am aware, a very small part. Yet nothing is more striking in the history of international relations than the appeal made to the notion of right and justice. Since the relation between actual law and the theory of justice is not critically examined, the student not unnaturally concludes that all talk of justice is mere rationalisation, a concession to the strange desire that man seems to have

to justify or explain himself to himself and to others. Philosophy goes by default, with the result that the student is least equipped to tackle with detachment and method just those problems which have the strongest emotional appeal, and in relation to which the fiercest contests are likely to be waged.

The neglect of philosophy is clearly not due entirely to the hard-headedness of the social scientists. It is due at least as much to the fact that with few exceptions philosophers have not recently devoted much attention to social problems, and, in particular, to the fact that the teaching of ethics has not been brought into relation with present needs. The student of ethics is given an account of the various ethical systems, but except in the case of utilitarianism the bearing of these systems on social and political problems is not made clear to him, nor is he enabled to derive from them any criteria for evaluating particular social institutions or for comparing different societies with one another. Thus the students of philosophy have seldom any detailed knowledge of social facts or even of the actual working of moral codes; while the students of social science are given no training in ethical analysis. It is clear that in these circumstances the synthesis of social studies which is so urgently needed is not likely to be attained, and that great changes will have to be made in the teaching of both social science and social philosophy if the universities are to make the contribution they ought to make towards the rational ordering of society.

Some Parasites of Domestic Animals

The following article is adapted, by kind permission, from the Bulletin of the Ontario Research Foundation, Toronto. Parasitic conditions among domestic animals are very similar throughout the Northern Temperate Zone and the conditions described may be observed on both sides of the Atlantic.

PARASITES, other than bacteria, have been recognised for thousands of years as a scourge of man and beast. But, as Chandler says, "With the progress of civilisation many of the human parasites are falling by the wayside and many of them are doomed as a result of a conscious effort to eradicate them plus the sanitary improvements incidental with civilisation." This is especially true in the North Temperate Zone where, as Hall says, "the cook, the barber, the laundryman and the plumber have made their lives too insecure."

Dr. Hall has pointed out that there is less likelihood of parasitic infection in humans than in domestic animals, since the latter spread infection by soiling their own tables and contaminating their drinking water. Greater concentration of humans in cities usually leads to the adoption of more sanitary measures, therefore fewer parasites, but the greater concentration of

animals under domestication tends to have the opposite effect. Though there is still much to be learned about the parasites of animals there is also a need for a wider dissemination of existing knowledge. It will be possible to deal with only a small part of this in the succeeding paragraphs.

The number of horses in our country has been reduced since the introduction of automotive power. Perhaps for this reason less importance has been attached to their welfare, and it is not generally realised that a high percentage harbour parasites. This can be illustrated by collecting a sample of horse faeces in a covered glass jar and keeping it in a warm place for a few days. If the animal is parasitised the faecal sample will contain worm eggs which, when they hatch into larvae, can be readily detected as they crawl up the sides of the jar. Under natural conditions these young worms or larvae

crawl up blades of grass and shed their skins. At this stage if eaten by a horse they would be liable to infect it. This is the typical life history of many of the intestinal worms of horses.

Another parasite of the horse with which some owners are familiar is the bot fly, of which three species are known. These three kinds, as well as having a different appearance, have different habits; one attaches its eggs chiefly to the hairs below the chin, another to the hairs around the lips and nostrils, and the third more to the hairs of the legs. In the latter case the eggs will not hatch until they are licked by the animal. Contrary to popular belief the flies do not bite or sting the horses, as they have no biting mouth parts or stinging apparatus. They frighten the horses and bother them by hovering about during the egg-laying process. The larvæ, after hatching, make their way into the animal by penetrating the mucous membranes or perhaps the skin, and eventually the young grubs reach the stomach. Within the stomach the larvæ grow to maturity, are passed out in the feces of the animal, and change into adult flies. A number of observers have the erroneous view that the larvæ eat the lining of the stomach. This misconception probably arose owing to their having noticed the red appearance of the stomach lining or mucosa and finding the larvæ present, but they did not know that normally a considerable part of the horse's stomach has a reddish appearance. The screening of the horse's nose during the season of fly attack will help to prevent infection. Singeing egg-laden hairs or washing with warm water will destroy the eggs. A treatment is also available for infected animals but should be carried out by qualified veterinary surgeons.

Parasites of Cattle

The parasite which is perhaps of most importance to the cattle industry is the ox warble-fly. The habits of this insect are somewhat similar to those of the bot flies mentioned above. The fly lays its eggs on the hair of the legs. The larvæ, on hatching, penetrate the skin and begin a complex journey through the animal, eventually reaching its back. The skin along the back is perforated, and at maturity the larvæ emerge through these openings. A short time later they change into adult flies. Although this parasite can neither bite nor sting it causes loss to the owner in two ways: first, the terrified animal runs about frantically, which retards its gain in weight; and secondly, the value of the hide is very materially reduced because of the holes made in it.

There are difficulties in the way of eradicating this fly, but a treatment has been discovered which kills the

grubs in the backs of the cattle. This can only be successful, however, if all treated cattle are kept in a district well isolated from others by a natural boundary. Otherwise flies from adjoining districts may come in and re-infest the cleaned-up area, as it has been shown that they can travel for at least 12 miles.

The outer part of the intestine of cattle is used for goldbeaters' skin. In many cases it cannot be used for this purpose because of the nodules on it, which are produced by an intestinal worm. The young worms, on being swallowed by the host, migrate into the intestinal wall. They develop here for a time then return to the lumen of the intestine, where they grow to maturity. In many cases, however, the larvæ do not return to the lumen, and it is these that cause the nodules.

The intermediate stage of a human tapeworm, the so-called "beef-tapeworm," may be found in cattle, but thanks to meat inspection and the more sanitary habits of our population, its occurrence is less frequent than was previously the case. Furthermore, thorough cooking of food removes any danger of human infection from food-borne parasites.

Parasites of Sheep

The common tapeworm of sheep—*Moniezia expansa*—is noticed more readily than some of the other parasites because of its conspicuous size. A surprising number of these are often found in quite young animals. The answer to the question, "How are sheep infected with this parasite?" is still unknown, as all attempts of science to unravel the life history of the worm have been negative. Consequently it is not possible to show experimentally the effect of the parasite on the host.

Many of the other intestinal parasites of sheep are quite small, and might be overlooked by the casual observer, but they have been shown to have a harmful effect on the host. A worm that produces nodules on the intestine similar to those found in cattle is responsible for a considerable annual loss in the casing industry.

The sheep nose fly, which is similar to the bot fly of horses and the warble-fly of cattle, passes a part of its life history in the frontal sinuses of the sheep. The fly deposits its larvæ in the nostrils of the animal and the young grubs travel up to the frontal sinuses. Here they grow to maturity and may be quite a source of irritation to the animal. The larvæ, when fully grown, escape to the exterior through the nostrils and change into flies.

The common roundworm of hogs, technically known as *Ascaris*, infects a large percentage of the pigs raised in this country. A closely related form is infective to humans. Because of the nature of the life cycle of the

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parasite it is most harmful to young animals. The eggs of the worm are passed in the faeces of an infected animal. They have a thick, impervious shell which makes them quite resistant to external conditions. The eggs develop to the infective stage on the ground, but they do not hatch until eaten by a suitable animal. The larvæ, on hatching from the eggs in the small intestine, migrate through the body of the animal. After penetrating the intestinal wall they enter the blood stream and travel through the liver, heart and lungs. During this time they grow rapidly. They then make their way up into the trachea from the lungs and on reaching the œsophagus are swallowed, and come to lodge in the small intestine where, under suitable conditions, they grow to maturity and begin to produce eggs.

Although few will deny the harmful effect of parasites in the intestine, the most serious damage is done perhaps by the larvæ in migrating through the lungs. It is quite easy, for example, to produce a fatal case of pneumonia in a laboratory animal, such as a guinea pig, by feeding a large number of infective eggs. Fortunately, pigs, under average conditions, are not usually exposed to enough infective larvæ at one time to produce fatal cases of pneumonia.

The intermediate stage of a human tapeworm, *Tænia solium*, is sometimes found in a small percentage of pigs. The small, bladder-like cysts of infected animals are found chiefly in the heart muscle, and if uncooked meat containing these is eaten a tapeworm may develop. This parasite is fortunately much rarer than formerly.

Books Received

- The Negritos of Malaya.* By IVOR H. N. EVANS. (Cambridge University Press, 25s.)
- Flying Fox and Drifting Sand.* By F. RATCLIFF. (Chatto & Windus, 16s.)
- British Consul.* By E. HAMBLOCH. (Hartap, 10s 6d.)
- Mother Earth.* By G. W. ROBINSON. (Murby, 5s. 6d.)
- Outline of Historical Geology.* By A. K. WELLS. (Allen & Unwin, 12s. 6d.)
- Bio-Politics.* By MORLEY ROBERTS. (Dent, 15s.)
- Aristotle: Parts of Animals, etc.* Translated by A. L. PECK and E. J. FORSTER. (Loeb Classical Library; Heinemann, 10s.)
- Food and Physical Fitness.* By Professor E. W. H. CRUICKSHANK. (Livingstone, Edinburgh, 5s.)
- How to Make Forestry Pay.* By RICHARD COKE. (Heffer, 1s.)
- The Penrose Annual, Vol. 40.* Edited by R. B. FISHENDEN. (Lund Humphries, 10s.)
- Racial Cleavage.* By ISABELLE M. PAGAN. (Theosophical Publishing House, 7s. 6d.)
- A Philosophy for a Modern Man.* By Professor H. LEVY. (Gollancz, 7s. 6d.)
- A Short History of Naval and Marine Engineering.* By Eng.-Capt. E. C. SMITH. (Cambridge University Press, 18s.)
- South from Tombstone.* By D. DE L. HUGHES. (Methuen, 8s. 6d.)

Correspondence

LITTLE FURRY MEN

To the Editor of DISCOVERY.

Sir,—In your December number under the title of "African Mystery Beasts" is a reference to "Little Furry Men." In 1927 I was with my wife coasting Portuguese East Africa in a Japanese cargo boat. We were sufficiently near to land to see objects clearly with a glass of twelve magnifications. There was a sloping beach with light bush above upon which several dozen baboons were hunting for and picking up shell fish or crabs, to judge by their movements. Two pure white baboons were amongst them. These are very rare but I had heard of them previously. As we watched, two little brown men walked together out of the bush and down amongst the baboons.

They were certainly not any known monkey and yet they must have been akin or they would have disturbed the baboons. They were too far away to see in detail but these small human-like animals were probably between four and five feet tall, quite upright and graceful in figure. At the time I was thrilled as they were quite evidently no beast of which I had heard or read.

Later, a friend and big game hunter told me he was in Portuguese East Africa with his wife and three hunters, and saw a mother, father and child, of apparently a similar animal species, walk across the further side of a bush clearing. The natives loudly forbade him to shoot.

I do not doubt the existence of these "furry men" and probably over a wide area, and I hope you will publish any other information you may receive.

Yours faithfully,

Chilworth, Surrey.

CUTHBERT BURGoyNE.

COLOUR PHOTOGRAPHY

To the Editor of DISCOVERY.

Sir,—I have been experimenting almost constantly during the past seven years on the perfection of an automatic camera for the securing of photographs on paper in full colours. Some few months ago I met with success and recently completed the construction of a finished model.

I feel justified in making the claim that my invention will revolutionise the photographic business so far as Studio and fashion work are concerned, and base my claims upon the following points:

- (1) The Colour Camera is entirely automatic in action and as simple in use as an ordinary field-camera. An absolutely unskilled worker can operate it.
- (2) Colour rendering is accurate and variation or loss of balance in colour-values impossible.
- (3) Colour exposure-meter and calculations are unnecessary—exposures are entirely governed by the camera without any form of adjustment by the operator.
- (4) Simple and inexpensive in construction, it could be marketed to professionals in a studio model to use own lenses at a figure below £10, allowing for advertising expenses, selling, etc.

I have during the past two weeks taken upwards of thirty studies with the crudely-constructed, experimental model.

My invention when marketed will make it possible for studios throughout the country—the world for that matter—to supply direct-colour portraits on paper at moderate figures in all sizes.

Yours faithfully,

Bournemouth, Hants.

D. G. H. WADDINGTON

Art in 17th Century Europe

DISCOVERY reviews the magnificent exhibition of 17th century art at the Royal Academy, Burlington House, from its own point of view.

THE 17th century affords an interesting study from many points of view. It saw the lifetime—or most of the lifetime—of an extraordinary number of great men—several of them among the very greatest in most of the arts and sciences—Newton, Galileo, Descartes, Velazquez, Milton, Wren.

Also, it had much in common with the present half-century, for it was an era of transition, and therefore of instability and restlessness, of boisterous energy, of clashes between conflicting "ideologies" (to use a modern barbarism), of wars and rumours of wars. The old religion had been shaken by the Reformation, but was strongly re-established, in Italy, by the Counter-Reformation. The Renaissance, which had begun in Italy 300 years earlier, had slowly extended its vivifying and civilising influence over the whole of Europe, and the culture of the day was a curious mixture of classical enlightenment and ardent scientific research, with the most unreasoning credulity. There was gross materialism in thought, reflected in a sensuality of manners rivalling that of the 15th century in Italy, which the Puritans in Britain, and the Huguenots and Jansenists in France, strove—mostly in vain—to check. Pageantry and ceremonies were in great favour, and nothing in the way of a "show"—from portly and pompous prelates in gorgeous vestments and attended by Negro pages leading monkeys in chains to a dance of half-naked pseudo-classical nymphs—came amiss to the gaping populace. Dress became more and more elaborate, and especially for men, culminating in the full-bottomed wig.

Yet, notwithstanding all this, the Age of Reason dawned palely on the horizon; and the conflict between new and old had many picturesque and romantic sides. All these tendencies can be seen in the Exhibition opened on Jan. 3rd, at Burlington House. The Baroque—the cult of extravagance, and of restless and sensuous emotionalism—may be studied in the numerous works of Rubens in Rooms 3 and 4 at the Exhibition, in those of the lesser Flemings, and in the one El Greco in the Spanish room, the only picture no tin British possession (lent by the King of Rumania). Here are also three works by Velazquez, of whom it may truly be said: "He was not for an age, but for all time." His "Water-Carrier" is in his hard and dry early style—but note, in the superb painting of the pots in the foreground, the difference between the blurred so-called realism of photography and such "representative" work as this.

Velazquez's only peer as a painter is the great Dutch-

man, Rembrandt, many fine examples of whose work appear in this Exhibition. Compare Velazquez's "Portrait of a Gentleman," full of melancholy Spanish hauteur (one of his most subtle paintings), with Rembrandt's magnificent study of Admiral Tromp, his hands gripping the arms of his chair as though the old sea-dog were in the act of rising to go and command his flagship, the British foe having been once more sighted. Do not these two portraits approximate closely, in consummate skill and breadth, and in psychological insight?

The Exhibition is particularly rich in works of the Dutch School, all harmonious and restrained in colouring, and closely observant of Nature, including the beautiful effects of light and shade, in their interest in which the Dutch foreshadowed the French "Impressionists." One room (Room 7) is one of the most interesting and cleverly arranged in the whole show; the pictures are all landscapes or seascapes with shipping; in the middle of the room are three exceedingly beautiful and decorative models of Dutch sea-craft which harmonise admirably, both in subject and colouring, with the surrounding pictures.

Italian painting, that had led the world, was just then at a low ebb. The beautiful, if somewhat trivial, Venetian rococo art of the early 1700's was yet to come. Salvator Rosa, the most important Italian painter of the time, is, however, represented by one picture, interesting as being one of the few portraits he painted.

British painting, latest of all to develop, is here represented mainly by adopted citizens of foreign birth. There are some charming female portraits by Cornelius Johnson; and the elegant, highly-finished work of Van Dyck is abundantly represented in this Exhibition. Here are also two works by Van Somer, a charmingly delicate colourist, and a good many works by both Lely and Kneller, all (especially the former's) so stylised as to be somewhat uninteresting. The French school is well represented, though the Claudes are, on the whole, inferior to those in the National Gallery; there are several fine Nicolas Poussins, and a very striking J. F. Millet—worthy of its exciting subject ("Destruction of Sodom and Gomorrah").

Several fine tapestries are shown in two of the rooms; also three large and impressive statues—one by the great Bernini; some carvings by Grinling Gibbons; and beautiful examples of the musical instruments of the time. Also a very lovely collection of silver; and two rooms full of drawings, glass, and prints—among the drawings some fine examples of Rembrandt's work.

Many readers of DISCOVERY will be interested in Hawksbee's Air Pump, quaintly mounted on a wooden support carved in baroque style.

MARY BARNE.

The Paris-New York Radio Telephone

New installations at Pontoise and Noiseau

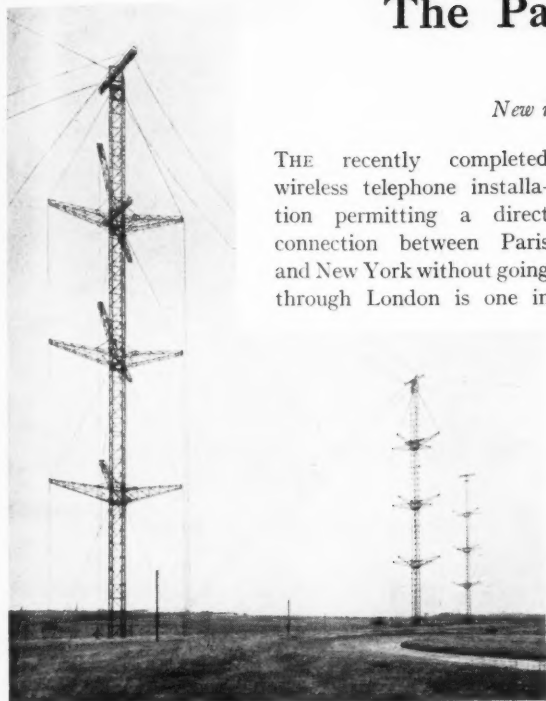
THE recently completed wireless telephone installation permitting a direct connection between Paris and New York without going through London is one in

lengths at certain times, and to insure against accidental breakdowns. In case of necessity, both transmitters can be used together to double the capacity of the line. The wavelengths actually used are 16.58 m., 21.80 m., and 28.76 m.; a fourth in the neighbourhood of 40 m. is in reserve.

The station can transmit musical frequencies from 50 to 11,000 cycles and is designed with special connection transformers which give it, at 80 per cent. modulation, a consumption about equal to that of an ordinary 10 kW transmitter. A further saving of current is obtained by a system of rectifier amplifiers acting on a current at 6,000 cycles which polarise the grid of the transmitting tubes when the subscriber stops talking. This cuts off the transmission of the carrier wave, which is broadcast only when speaking is actually going on. Current for the transmitter is obtained from mercury vapour rectifiers in glass tubes, which are designed with control grids to cut off the current in case of overload. The pressure used is 10 to 12 kV. Three automatic attempts at reclosing of the circuit are made before it stays permanently open. Pilot stages and feeds are in duplicate. Conversations are passed through a scrambler.

The receiving station is designed for the reception of waves of 15.61 m., 20.73 m., and 30.77 m. The receivers are of the frequency changing type with separate heterodyne. The aerials are of the directional type mounted on guyed masts 246 ft. high. The reflectors have been arranged to give a highly concentrated beam

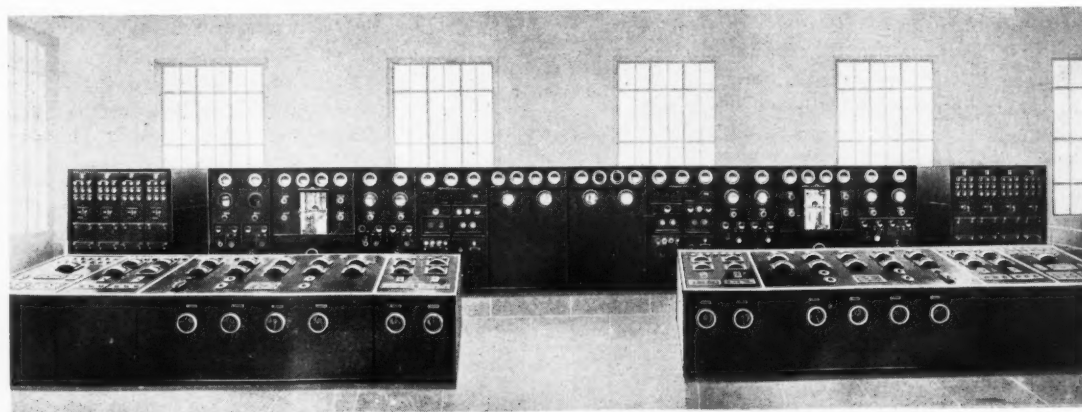
(Continued on page 55)



Transmitter aerials at Pontoise

which several novelties have been introduced. The French end of the installation consists of a transmitter at Pontoise and a receiver at Noiseau, the former just north and the latter just south of Paris. At the American end the receiver is at Netcong and the transmitter at Lawrenceville, north and south of New York.

The Pontoise station has two independent transmitters each capable of working on two wavelengths in order to overcome the fading which affects certain wave-



General view of twin transmitter installation, Pontoise

Insect Attack in Hardwoods

By Ronald C. Fisher, B.Sc., Ph.D.

Forest Products Research Laboratory, Princes Risborough.

Numerous enquiries received each year at Princes Risborough concerning damage by insects to timber and manufactured products have shown that the different types of injury are not easily distinguished by the majority of timber users.

COMPARATIVELY unimportant forms of insect defects, such as the holes made by pinhole borers, are frequently confused with the damage caused by serious pests of seasoned timber, such as, for instance, *Lyctus* powder-post beetles, which are not uncommonly held responsible for any worm-hole that may be present. Such a conception of the economic importance of *Lyctus* is not only incorrect—despite the serious damage it can cause to the sapwood of most commercial hardwoods—but may lead to unnecessary alarm and involve importers, merchants, furniture manufacturers and others in disputes which, in most cases, should never arise.

While the Entomology Section of the Forest Products Research Laboratory exists to be of assistance to the timber-using trades and industries in their insect problems, and is always pleased to identify wood-boring insects and the damage they cause, it may be of use to summarise briefly the distinguishing features of *Lyctus* attack as compared with "pinhole" injury, the presence of which in some timbers has rendered necessary the creation of special "sound wormy" grades.

Pinhole borer damage is most prevalent in timbers from the tropical and sub-tropical parts of the world, where the beetles responsible are more abundant than in temperate climates. It is not surprising, therefore, that the extent of the deterioration caused by the presence of their tunnels has within recent years assumed special importance in connection with the marketing in this country of new timbers from the tropical forests of the Empire.

Lyctus attack, on the other hand, occurs commonly in hardwood timbers throughout the world, but is not taken into account in the grading of timbers unless exit-holes are present; and even then no distinction is made between this type of damage and that caused by pinhole borer attack. When *Lyctus* damage is present in timber the grubs will

continue to live and the damage increases during and after manufacture, unless the wood is sterilised by heat treatment in a kiln or by some other suitable method. Pinhole borers and their grubs, however, are never found alive in seasoned timber, and therefore no extension of the damage they cause can take place in seasoned stocks.

Ability to distinguish between these two common types of insect damage to hardwoods and their comparative importance as affecting the utilisation of attacked timber is therefore of the greatest practical interest, especially in relation to specifications and contracts.

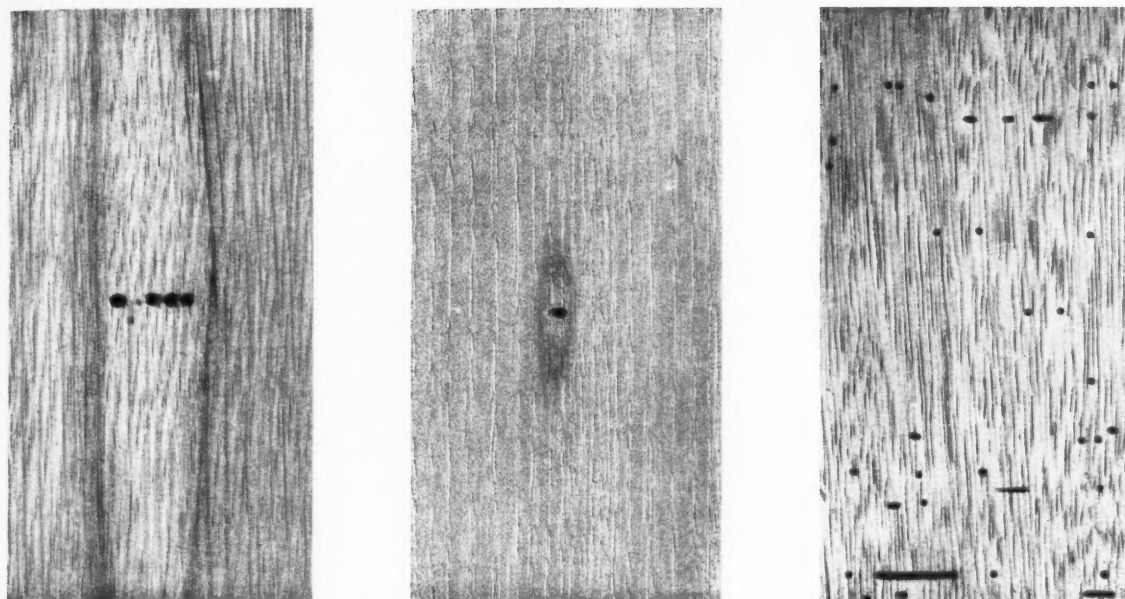
The table opposite summarises the chief differences and should enable both forms of injury to be recognised without difficulty.

Experience has shown that in some countries trees in which no external evidence of insect defects is apparent are found on felling and conversion to have been attacked by pinhole borers at some earlier date in their life. While little information is at present available on the causes of such attack, there is evidence to suggest that a check to the growth of a tree caused, for instance, by drought, fire scorch or storm injury, may render it temporarily susceptible to infestation by pinhole borers, from which it eventually recovers on regaining its usual vitality. The quality of the timber from such trees, apart from any degrade that may result from the presence of the old insect tunnels, is not affected.

Another type of insect damage to timber, frequently confused, particularly by householders, architects and builders, with either of the above, is caused by the furniture beetles. These insects attack old furniture and structural timbers, softwoods and hardwoods, heartwood as well as sapwood, and many reduce them to a powdered condition. They are rarely of importance in timber yards or manufacturers' premises. Further information on insect



An attack by lyctus beetle on an oak board, showing the effect on the sapwood before and after planing.



The appearance of damage by the pinhole borer is illustrated in these three planed specimens. They are, from left to right, American oak, English ash and tropical hardwood. (Crown copyright of the illustrations to this article is reserved.)

damage to timber and upon methods of prevention and control is available in the publications of the Laboratory,

particulars of which will gladly be supplied on application to the Director.

Lyctus Damage

Caused by insects attacking partly and recently seasoned timber; standing trees and freshly-felled logs not attacked.

Occurs in hardwoods only, and is confined to sapwood.

Caused by boring of grubs (larvæ) emerging from eggs laid within the vessels or pores of the wood by the beetles, which themselves do not bore.

Tunnels filled with fine flour-like wood-dust.

In severe attacks, sapwood may be completely powdered.

Tunnels not darkly stained.

Tunnels cut at first along the grain of the wood, but in later stages of attack may run in all directions.

No entrance holes made by beetles; exit-holes circular and approximately 1/16 inch in diameter.

Damage steadily increases in seasoned timber and manufactured products. Infested timber should not be used unless sterilised.

Pinhole Borer Damage

Caused by insects attacking green timber in standing trees or felled logs; seasoned timber not attacked.

Hardwoods most frequently attacked, but softwoods (coniferous timbers) not immune. Sapwood and heartwood affected.

Caused by pinhole borer beetles, which bore through the bark or exposed wood surfaces and cut winding tunnels in the timber. The grubs (larvæ), emerging from eggs laid in the tunnels, do not bore, but feed on fungus growing on the walls of the tunnels.

Wood-dust absent from tunnels, or, if present, in tightly-packed wads.

Wood never powdered.

Tunnels usually darkly stained, often surrounded by a streak or patch of discoloured wood, due to fungus.

Tunnels cut across the grain of the wood.

Entrance and exit-holes made by beetles circular and varying from 1/50 inch to 1/4 inch in diameter, according to species.

Damage ceases when timber is seasoned; no danger in using timber showing pinholes.

Paris-New York Radio Telephone

(Continued from page 53)

so that reception in New York is equivalent to that obtained when receiving a 300 kW broadcasting station with an ordinary aerial. The connection of the system to the telephone network is through special apparatus

in the interurban telephone exchange in Paris. To correct the differences in volume given by various telephone installations, the equipment includes a special amplifier which brings the sound volume of any telephone on the network to an optimum value.

Book Reviews

The True and the False in Art

Art and Understanding. By MARGARET H. BULLEY.
(Batsford, 15s.)

Miss Bulley has done what few writers on art do; she has given us the fullest possible pictorial illustration of her text. She has also made her book as convenient for sectional study as possible. How the publishers can produce so finely illustrated a work at so low a price I cannot understand.

Miss Bulley's general theory is that of the philosophical idealist in its simplest and most rational form. Her æsthetic is based on the general assumption that there is available a kind of reservoir of inspiration, which she defines symbolically as "the Idea," from which the artist can draw if he is able or willing to do so. If he is not in contact with it then his work is counterfeit and insincere. She shows, with some wit, that art cannot consist of mere originality, quoting two statements: "women's souls, are violet powder strewn on coals," and a sales notice, "YIMAGINATIVE POTTERY," as instances of the fundamentally insincere and yet solidly original.

Simply—perhaps too simply, from a philosophical point of view—her Idea is thus described:

"The Idea refers to the idea of harmony, spiritual in essence, coming to man in the form of a mind-picture of a thing. It will expand in full detail in his mind as he develops its material appearance in terms of medium and technique, and by its power he will be led."

This is a curious extension of the rather static Platonic theory of ideas into an æsthetic which conceives of ideas as dynamic and developing. It is no mere reference to a series of ideas "laid up in Heaven."

The development of her theory is interesting. The intercourse between the creative mind and its ideas, in which the sense of beauty resides, is the reality of life. It is known through what William James has called the "concrete movements of the soul in communication with the nature of things." The idea appears as a living thing, and brings the conception of abstract art to the ground. Ideas dominating mechanical things are ideas which are not of the type which illuminates the artist. And so Mr. Herbert Read's claims for abstract art vanish. She quotes Picasso's wise remark that "Nature and Art being two different things cannot be the same thing. Through Art we express our conception of what Nature is not." Art, in brief, draws from an inexhaustible spring of ideal life which is not immediately apprehensible to the senses.

Miss Bulley has read wisely and widely. She writes at great length in order to express her points, and writes

well. But she does not make her arguments clearly, nor is she concise and easily read. Aware of this, she has a large section at the end of her book (which is better read first) in which she discusses her large accumulation of illustrations in sequence. Here her firm distinction between true art and counterfeit art is made apparent to the simplest mind. Indeed, I know of no assembly of illustrations so convincing and so vivid, nor one so likely to instruct the groping mind of the amateur who "knows what he likes" but is willing to dislike it if reasons are given. Here are reasons enough, staring him in the face. Here is the contrast between the "random pattern of physical appearance" in a photograph of trees, and the ordered logic of "the Idea" which the artist brings to his version of a similar scene (by Cézanne). Here is primitive child art showing the vague dawning of such logic, only partially realised, and the full and violent counterfeit art of an "Academy" work. Original paintings and copies placed side by side show the true artist and the mere hack worker attempting identical subjects. One group of four pictures, all of similar subjects, shows the descent from the Idea to the Counterfeit.

Uncompromising Dualism.

Indeed, Miss Bulley has made the distinction completely obvious to the meanest intelligence. But even the moderately mean intelligence will quail at her very lengthy expositions of what is, in effect, not an argument but a dogma—that art must partake of the Idea, which itself is part of Universal Mind. I must confess that such a statement leaves things much where they were even at the end of her discourse. The average philosopher is quite unable to explain fully what he means by Universal Mind. Miss Bulley's universe is of the simplest character, a plain and uncompromising Dualism, almost as simple as that of the Manichees. Good and evil have each a positive existence in art, as her illustrations show. I always suspected that there was more to be said for the Manichees than the Christians thought. For the Evil in art is constantly surging against the defences of the Good, and is far more often victorious than not. Whatever the Universe may consist of, I am clear that Dualism is true in the world of Art, with the scales weighted on the side of Satan. In casting a small extra weight on the side of Good, Miss Bulley has fulfilled her object. She deserves the warmest congratulation on a vigorous and most competent work.

STANLEY CASSON.

Is Sound Recording an Art ?

Sound Recording for Films. By W. F. ELLIOTT. (Pitman, 10s. 6d.)

This book breaks fresh ground in several respects. For the general reader it gives, in some detail but without technicalities, the exact procedure adopted in making records of the sound required in motion pictures, and shows what an artificial business this is, but with the justification that the highly developed technique conceals the artifice and makes, sometimes, art. To the scientist and engineer the book is curious in that the author, obviously having no formal technical training, develops a philosophy for recordists, but in a fatalistic attitude. He says that the experienced recordist should be given a share in developing the sound script, even to the point of organising the script instead of the director, but at the same time admitting that his function is to carry out his job in a perfectly dependable manner at the behest of the director. He deduces that the salvation of the recordist is to be found in the documentary type of film, where the sound man, if he is not coincident with the director, can at least find scope for new ideas and put them into practice without degrading reactions.

An important technical contribution to the art of sound recording for motion pictures is the way in which the author works out the technique of consistent sound perspective in the single channel, while completely missing the scientific point about the peculiar property of the microphone which makes this possible.

The methods that have to be adopted in getting the sound-track right are described in general terms, and the non-specialist reader will be surprised to learn the extent of pre-scoring and post-scoring, that is, recording the sound before and after the pictures are made. The former method is generally adopted with long musical sequences with complicated shots demanding synchronism, such as a dancing spectacle or Grace Moore singing; while post-scoring is used for such effects as adding a fitted musical background or special noises which might disturb the artists during the shooting. Dubbing, which is making up a sound-track from a number of isolated sequences, and re-recording, which generally means altering the relative loudness levels because it is not always possible to make these agree when the sequences are shot on various occasions, are thus major activities in the sound department of a film studio; often a separate staff is set aside for this work.

An interesting sidelight is thrown on the translation of sound-tracks into languages other than the original, a practice introduced (but crudely) in the early days of sound-film, and then abandoned, it having been found that shooting in several languages at the same time gave superior results. The idea has, however, been recently developed to a high degree of precision, especially since some countries, such as Spain and Italy, demand that foreign films must have the speech in the relevant language. A number of machines has been introduced which permits the registration of the rhythm of the original for information of the translator. Eventually a native set of artists are rehearsed and speak their lines into a recording system while the original picture images are thrown on to a screen in front of them, the new recordings being printed with a duplicate negative of the original picture. All this naturally does not concern the audience directly, since motion pictures are largely a fiction in any case and only serve to convey a sequence of emotion. Nevertheless, the most successful films seem to have been those which have used the film medium in ways which could not be made effective

with any other means, and the more the peculiar properties of editing the film material are developed the better value will the audience get.

L. E. C. HUGHES.

The Birds Sing Again

More Songs of Wild Birds. By E. M. NICHOLSON and LUDWIG KOCH: with gramophone records. (Witherby, 15s.)

Those who enjoyed the songs collected by the authors in their first series, published last year, have been looking forward to this second collection. They will not be disappointed, for the new series is quite as good as, and in some respects better than, the first; many of the quieter songs, e.g., the chiff-chaff's, come through more clearly, and wind interruption has been diminished.

The difficulties encountered, and how they were overcome, are explained in the opening chapters. The Parlophone recording van had to be jacked up on level ground so as to keep it absolutely rigid, since the least shaking would spoil the records. It was difficult to obtain solos by blackcap and redstart, for they preferred to sing in chorus, with a confusing background of other songsters. The "sound scene," a record which contains songs and calls of some sixteen species and lasts three minutes, was selected and blended from nineteen records with a total playing time of 95 minutes. Mr. Koch rightly pays tribute to the Parlophone Company for the opportunities afforded by them, for as a business proposition the work would be impossible.

This time there are six records instead of four. I remember, when reviewing the first series, saying that I doubted whether it would be possible to obtain songs of skylark or woodlark. I am glad to find that both these songs have been secured; we clearly hear a typical skylark, both ascending and descending and on the ground, and the woodlark's Ariel phrases float down to us with delightful realism. The curlew's record, obtained only with difficulty, includes two different alarm notes as well as the sweet, bubbling song, sounds which at once transport the listener to the moors.

Another record reproduces the babel of a heronry in the breeding season; alarm cries of and "conversation pieces" between the old birds, and the hungry castanet-clacking of the young, together create an almost deafening clamour. Songs of blackcap and garden warbler, often confused by novices, follow in succession on one record. Though not the most successful technically, the contrast between the blackcap's spasmodic outburst and the garden warbler's steady flow of melody is cleverly shown.

To have succeeded in bringing the wood warbler's song to the gramophone is an accomplishment, for its high frequency—6,000 cycles per second—presents difficulties. Both the pure "canary" call and the shivering trill are distinctly heard, though the volume of sound is small. Bird-lovers unacquainted with that rather elusive bird, the willow-tit, can now learn its "tchay" note from the gramophone. The nightjar's churr comes through quite perfectly on another record; you can hear its rise and fall and the slight pause as the bird takes breath. The blue-tit's "glass-clear" notes also reproduce brilliantly.

The jerky snatch of the redstart is less successful. The tree pipit's record is of its song uttered from a perch, which falls far behind the cascade of sweetness poured out in its parachute descent, and the few nuthatch's whistles are almost inaudible. Mistle-thrush and stock-dove are both clear and loud.

The "sound picture" contained in the last record will appeal to many listeners, for it tests their ability to pick out the notes and songs of the different species of which it is composed. In this little owls hoot, but I miss their "pkeu" call heard so often round my own house. The finale is supplied by a rookery: "this is what a rookery sounds like to a rook." Fortunately most of us can listen to it only at a distance. Indeed, many of the songs are louder on the records than in the field, but on the gramophone you can make the needle repeat the song till you know it thoroughly; birds in the bush are not so obliging.

There is a table showing the frequencies of the various notes: the highest frequencies, from 4,000-6,000 cycles per second, are reached by the warblers, mistle-thrush, blue-tit, and curlew; the lowest, from 325 to 550, are those of magpie, heron, and stock-dove.

Messrs. Koch and Nicholson are to be congratulated on this most interesting and instructive compilation. It is good to know that they propose in time to make sound-books of all British birds: in this work they deserve the support of all scientific and educational authorities.

The book is well illustrated by photographs by Mr. Oliver Pike and others, and Mr. Nicholson writes descriptive notes on the various species. The records, of course, sound best on an electric gramophone, but an ordinary clockwork instrument gives good results.

E. W. HENDY.

A Serious Study of Psychology

The Psychologist at Work. By M. R. HARROWER. (Kegan Paul, 5s.)

Miss Harrower was formerly lecturer in Psychology at Bedford College, London, and research fellow at McGill University, Montreal. In a preface written by "her teacher and colleague," Professor K. Koffka, he states that what gives him particular pleasure is the fact that the general framework of her argument is that of the Gestalt theory. He refers to the persuasive and convincing nature of the book and the avoidance of any attempt to enlist the reader's sympathy for any of the "isms" that divide psychologists into warring factions.

The author is at great pains to "clear the decks for action," and in a preliminary announcement to the reader, asks the question: "Are you one of the general public for whom this book is written, or are you an experimental psychologist in your own right ready to confront me with your superior knowledge on every page?" Now, this is embarrassing. What category does the honest reviewer represent—we say honest, notwithstanding that honesty might quite well be evidence of over-compensation and therefore unreliable. All the same, we would first of all answer Miss Harrower's question and assure her that we feel no hostility whatever to her and we might add that her question shows just a little touch of irrational fear, which is strange in a psychologist. However, to business.

Psychology, the author tells us, suffers from the ease with which it lends itself to popular usage and exposition. She really means mis-usage and misrepresentation. "This fact robs psychology of its academic or scientific status." But aren't we all subject to the same disabilities? Chapter I tells us of the province of psychology, and we at once feel ourselves in agreement with the author in her attempt to reconcile the views of the materialist with those of the vitalist. In so far as each earnestly seeks after truth, we may conclude that some aspect has been seized upon and probably overstrained. The fault lies in our ineradicable habit of labelling the exponents of one or other view and then

deluding ourselves that we have settled the matter. The Gestalt theory, in so far as it argues in favour of a purposiveness running through the whole structure of creation, is competent to embrace the best in both doctrines.

In her own words the author offers her confession of faith with which we wholeheartedly agree, "Man's behaviour, man's mind, man's experiences, all of which are the psychologist's province, do not need to be considered as separated by an unbridgeable gulf from the more tangible phenomena of the physical sciences, for we may find in them indications of the same laws which govern other aspects." Chapter II deals with, "how we see the world," and cites certain experiments in optics, we might say in optical illusions, which, incidentally, negative the statement that seeing is believing, and which show the value of examining our impressions to ascertain the extent of their reliability. The unreliability of our impressions, whether they be physical or pertaining to our emotional outlook, is a substantial source of error in the conduct of our lives, and the author is passionately anxious to bring this truth home to her readers, in order that a more happy adaptation to the realities of life may be their lot.

The chapter on "our experiences of colour and sound" continues this examination. "Behaviour in its Primitive Forms" points out that whereas an isolated action may be examined by itself and appear as complete to the restricted observer, yet "simple reflexes are always under the influence of larger patterns of behaviour, only being emancipated by experiment or disease." A further chapter deals with more complex behaviour, and finally the author defines psychology as the attempt to get past the "press-the-button-and-the-light-goes-on" stage and to understand the fundamental causes at work. The book is not, we should think, easy reading, nor is it intended to be so, but to the individual who desires serious information on the subject of psychology it will appeal as a thoughtful and informed study.

JOHN WHITE.

The Origin of Totemism

Totemica: A Supplement to "Totemism and Exogamy." By Sir JAMES G. FRAZER. (Macmillan, 25s.)

The publication of *Totemism and Exogamy* in 1910 was a landmark in the history of anthropology. The appearance of that vast compendium of the facts relating to totemism in four large volumes running to close on two thousand pages put a period to a discussion of the origin and meaning of totemism, which had lasted for many years and was fast degenerating into a jejune contest in logic chopping. As has happened on so many occasions when Sir James Frazer has given to the world his views on topics of anthropological science, the publication of his great work diverted interest with fresh zest to observation in the field. In *Totemica* he has brought together the most important accessions to knowledge of the facts bearing on the institution of totemism which have accrued in the twenty-seven years which have elapsed since the publication of the earlier work.

The author's arrangement of the material here digested is not without significance. He begins with Australia, passes thence to Melanesia and New Guinea, and then goes on to India, Africa and America. Although the special relation held to subsist between men and animals, plants or other natural objects, which constitutes the core of totemism, was first recorded in America, the whole complex of beliefs, ritual and social regulation is to be observed in its most characteristic form among the

Australian aborigines. Since the War, under the auspices of the Australian Research Council, a series of investigations in the Australian field has checked and supplemented the observations of earlier explorers, of whom the late Sir Baldwin Spencer and F. J. Gillen rank among the immortals of anthropology for their work among the Arunta. It is, therefore, not surprising that Sir James not only opens with Australia, but also has devoted more space to it than to any other single area of enquiry.

Totemism is not a subject which lends itself to brief analysis. Of the new material presented here it must suffice to say in general terms that it affords no evidence which constrains the author to modify or revise his previously expressed conclusions. His views of the conceptional origin of totemism and its magical, rather than religious character receive ample corroboration; but it is interesting to note that from both Melanesia (Tikopia) and the aboriginal tribes of India comes evidence of something like a half-way house between magic and the worship which constitutes a religious rite. Especially interesting is the totemic significance of rock-paintings elicited from aborigines of West Australia by Prof. A. P. Elkin, and the parallel drawn by Sir James with the cave paintings of palaeolithic Europe. Had his analysis been carried further, it might perhaps have appeared to him that the cave art of France and Spain was the art of a people not merely artistically, but also culturally more advanced than the Australian. The art of palaeolithic man is that of a hunter; but the Australian rock-paintings make magical provision against the vicissitudes which befall one who is mainly a food-gatherer.

Needless to say, in his handling of his material Sir James Frazer shows the touch of a master. Neither his grasp of the essential, nor his style admit the advancing years.

E. N. FALLAIZE.

The Mystery of Scent. By H. B. C. POLLARD. (Eyre & Spottiswoode, 10s. 6d.)

This well-produced volume, though addressed primarily to hunting people, is by no means unworthy of the consideration of the biochemist; and Mr. Pollard has probably done the hunting confraternity an unexpected good turn by demonstrating that some of them, at any rate, are not merely engaged in "exercising horses." It is quite evident that the author has taken a great deal of trouble over a very fascinating and very puzzling subject; and, under cover of a playful style of writing that is occasionally a trifle exasperating, he has concealed a considerable mass of important results from painstaking research.

The author makes out a good case for his main postulate, that scent follows the laws that govern unsaturated vapours, and his "Scentometer," an instrument based on his observations, would appear to produce data in conformity with these. The instrument, incidentally, is obtainable from the publishers at a cost of 30s.

There seems to be no doubt whatever of the importance of the surface on which the scent is laid by the fox, and the author fully agrees with Peter Beckford's contention that the excellence of the scent depends on the relation between the state of the ground and that of the atmosphere. The actual chemical composition of the scent-material has never been ascertained, but it is likely, to say the least of it, that Mr. Pollard's theory of a rapid spread of the material to a film of monomolecular thickness gives a correct picture; and its accompanying property of reducing surface tension would be sufficient to account for its rapid diffusion.

It is probable that we are a long way yet from discovering

exactly what it is that hounds smell; Mr. Pollard's idea of partially muffling up a fox, either in a woolly jumper or in waterproof bootees, though it inevitably presents a charming picture, is under present conditions scarcely feasible.

Studies of British Birds. Written and illustrated by "FISH-HAWK." (Duckworth, 15s.)

This is in some ways an impressive book. The author's brief descriptions of a great many English birds are accurate and sometimes effective. He is clever with his pencil also, and the many drawings that illustrate the book are often true and not without life. "Fish-Hawk" is a man of great experience with the gun, and we can readily believe what the Earl of Radnor tells us in his foreword, that most of the author's leisure "has been occupied with either a gun or rod in one hand and a notebook and pencil in the other." Indeed "Fish-Hawk" tells us so himself, where he refers in one passage to the peculiar attraction that birds living in or near water have always had for him, "partly," he supposes, "because of their association with rod and gun . . . and also . . . because they are easier to observe than other birds." Armed with field-glasses, sketch book, and gun, he says, "one can stay indefinitely, observing, sketching and every now and again having a shot, for there always seems to be something interesting to watch." So that when the Earl of Radnor goes on to describe "Fish-Hawk" as a "bird lover"—well, that all depends on what you mean by the term. The importance of the matter is that, unless you are a bird lover, you may be able to write a sound textbook—this is not a textbook—but if you write descriptive sketches they will be dull.

The author is, throughout the book, a sportsman with some power of observation and a good knowledge of birds. For my own part, I do not attach great importance to the question whether a bird is "delicate" (a favourite word of the author, meaning, of course, good to eat). It would never occur to me to say of the sparrow hawk: "It would be a bad day for the English countryside if ever this sturdy-hearted and much maligned little sportsman (*sic*) were to become extinct." And in my view there ought to be a Wild Birds' Protection Act rendering it an offence to speak as follows of the majesty of shield duck: "There are few more exasperating things that befall a wildfowler than when, after many hours of patient watching in cold and discomfort, his only reward is a shield duck shot in the dusk under the mistaken idea that it is a goose or some more worthy fowl." Whether you agree with these statements may be a matter of taste—but one thing is beyond doubt, and that is, that unless you feel that love for birds and sympathy with birds that inspired Hudson and others, you can never write what is most worth saying of birds.

After all, if you pass with a glance most of our English song birds—thank God they are not shot—and content yourself with a short description of the appearance and flight of most of our other wild birds, for whom are you writing? Not for the novice, nor for the learned.

Mea Culpa: and The Life and Work of Semmelweis. By LOUIS-FERDINAND CELINE, translated by R. A. PARKER. (Allen & Unwin, 5s.)

These two papers are of considerable interest for the light they shed on the mental development of the author, whose *Voyage au Bout de la Nuit* achieved the unusual by being both a very good book and a popular success. They express, each in a different degree, the same view of mankind as that work did, but, being both personal declarations, very much more strongly.

The Life and Work of Semmelweis, written as M. Céline's thesis for a doctorate of medicine, expresses an opinion of humanity which, though low, was based upon a conviction that it was meant for better things, whereas, in *Mea Culpa*, which followed a visit to Russia in 1936, we find nothing but deep contempt and loathing. The assumption of depth of feeling is based, perhaps rashly, upon the extreme violence with which M. Céline chooses to express himself. "A preacher is on every dunghill," he says at one point, "the scummiest they are the more they like to spout."

Hailed by all departments of the Left as a brother, after some pointed comments on the more prosperous members of the community, he went to Russia. "The thing about Communism that gets you," he begins, "its great advantage, to tell the truth, is that it is going to tear the mask off man for us, at last!" But it is difficult to accept this somewhat hysterical denouncement of it as more than a piece of ill-considered misanthropy, which is a pity, since between the screams the more effective but less noisy voice of truth may be heard.

The Life and Work of Semmelweis is a straightforward account of the efforts of the Hungarian surgeon to get his ideas on the prevention of puerperal fever following childbirth (in which he anticipated the results of Pasteur's work) put into practice. As usual, too much blame is put upon those who did not immediately accept what afterwards turned out to be the truth.

M. Léon Daudet has declared Céline to be untranslatable, and *Mea Culpa*, written in a personal language based upon a low Parisian argot, is certainly a problem, though *Semmelweis* was written in quite simple French. Mr. Parker has conveyed into the English most of the sense and feeling of the original.

World Natural History. By E. G. BOULENGER. (Batsford, 7s. 6d.)

Author and publishers have here combined in a remarkable beneficence to the inquiring mind of the rising generation. The publishers are fully justified in their introductory statement that "this is the first comprehensive review of the Animal Kingdom to be published in modern form at so cheap a price." Mr. Boulenger, whose first-hand experience with animals of all kinds is well known throughout the scientific world, has clothed the bare bones of systematic classification with a wealth of incident and anecdote and ornamented it with a splendid selection of photographs and other illustrations. As Mr. H. G. Wells says in his preface, "No young gentleman's library . . . should be without it," and this reviewer shares Mr. Wells's happy remembrance of an old *Natural History*, illustrated not with accurate photographs but with far from veracious line-blocks.

The book and the production of the book being so excellent, it is a pity that a little more attention has not been paid to detail. Misprints abound; most of them, it is true, are scarcely dangerous, e.g., "guar" for gaur, "chevrotians" for chevrotains, "Orinthes" for Ornithes, "cinnibar" for cinnabar, and so on. But some are actually misleading, e.g., when the Ounce is spoken of as ranging as far as the "Atlas" Mountains, or an otter's holt is described as a "halt," or Sargasso is confounded with "Saragossa." One or two statements, moreover, would bear modification, if not correction. Mr. Boulenger is either remarkably lucky, or a very much older man than I have always supposed, if he has seen choughs haunting the Dorset cliffs; his description of swan-upping on the Thames is somewhat telescoped; the Eastern Mediterranean is the principal ground for sponge-fishing, and has been for centuries; and the ascription

of all non-Australian marsupials to South America implies that the opossum is extinct in the southern United States. It might also be indicated that the Kea parrot has never been proved to feed on living sheep, and that the reasons for bird migration are still under dispute. One more small criticism: would not the young gentleman who certainly ought to have this book in his library prefer to be told that "the animal is a good swimmer" rather than "the animal's natatory powers are considerable."

Short Notices

The Bird-Lovers' Book of Verse (collected by CHRISTINA CHAPIN. Witherby, 6s.), like every other anthology, is necessarily a reflection of individual taste. This one contains many charming poems about birds, some of which do not often appear in such collections. It is less comprehensive than Mr. Massingham's *Poems about Birds*, but the two books together provide a representative selection of bird poetry, old and new.

The Disappointed Lion (Country Life, Ltd., 7s. 6d.) is a collection of folk tales collected from the Bari people of Central Africa by A. N. TUCKER. Brought first to the notice of the public by means of broadcasting in the Children's Hour, these pleasant little tales of humans and animals are best fitted for reading aloud. They are interestingly illustrated by staves of folk-music; rather less so by woodcuts. By nature the tales are closer to European "fairy-stories" than to West African animal tales; and Kidden and her friends play a much more prominent part than do Miss Meadows and the Girls in another more famous series of African folk-tales.

Taha the Egyptian (M. CATHCART BORER. Pitman, 3s. 6d.) is a welcome addition to Pitman's "New Juvenile Library." The aim of the series is to acquaint young readers with aspects of life in various parts of the world by means of tales written by competent authorities. Miss Borer is conversant with the life of modern Egypt surrounding a typical excavators' camp, and the thrilling incidents of her tale are dovetailed into the archaeologists' work. It is by no means a bad thing to help young readers to realise that archaeology is not all dry bones.

In *Yoga: a Scientific Evaluation* (K. T. BEHANAN. Secker & Warburg, 10s. 6d.), it is a pity that the author spends so much time comparing the precepts of the system with those of Western philosophers, especially as the basic qualification for a Yoga student appears to be an unmitigated world-weariness. The most outstanding point of interest is the Yoga insistence on effort rather than on knowledge in the ultimate aim to unite the individual soul with the world soul. For this reason the latter part of the book dealing with controlled breathing, postures, and meditation, is of particular interest.

The Battery Book (H. H. V. CROSS. Technical Press, Ltd., 5s.) is a practical manual on the construction, charging, care, and repair of automobile and other batteries. It is well illustrated and fully indexed.

Tropical Aquariums, Plants and Fishes (A. L. WELLS. Warne, 3s. 6d.), details how to set up an aquarium, the plants required, feeding, ailments, etc., and also describes the species of fish. There is a number of line and colour illustrations.

Biology for Senior Schools, Book One (M. R. LAMBERT. Macmillan, 2s.) is simply written, with questions at the end of each chapter, and is unusually well illustrated with drawings and photographs.

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(Continued from page x)

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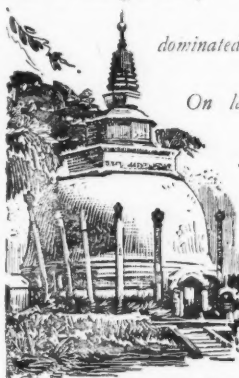
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